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~~MONTANA FISH & GAME DEPT.~~
~~HELENA, MONTANA 59601~~

# LIBBY DAM AND RESERVOIR PROJECT

## KOOTENAI RIVER

## CANADA AND UNITED STATES

## REPORT OF LIBBY PROJECT PLANNING COMMITTEE ON FISH AND WILDLIFE RESOURCES

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# LIBBY DAM AND RESERVOIR PROJECT

# KOOTENAI RIVER

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Report of Libby Project Planning Committee
on Fish and Wildlife Resources

Canadian Wildlife Service
British Columbia Fish and Game Branch
Idaho Department of Fish and Game
Montana Department of Fish and Game
U.S. Forest Service
U.S. Army Corps of Engineers
Bureau of Sport Fisheries and Wildlife

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February 1963

The scenic grandeur of Kootenai River basin is exemplified by the Duck Lake area of British Columbia where large numbers of waterfowl congregate. Preservation and development of waterfowl habitat here and in nearby Kootenai Flats in Idaho is of prime importance. (Photo courtesy British Columbia Government).

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# PREFACE

Libby Dam and Reservoir, a flood control and power project to be located on the Kootenai River, Montana and British Columbia (Kootenay River in Canada), was authorized for construction by the Flood Control Act of 1950 by the Congress of the United States. Construction is contingent upon ratification of a treaty by the Canadian Government and appropriation of funds by the United States Government. Estimated construction cost of the project is $308,000,000. Annual costs are estimated to be $12,654,000.

This report considers the impact of Libby project on fish and wildlife resources of the Kootenai River basin in the United States and Canada. Project effects on the basin's valuable fish and wildlife resources are discussed, and tentative recommendations for the conservation and development of these resources are advanced. For the purposes of this report, the area of project influence has been determined to be the Kootenai River drainage basin from Bull River watershed downstream to, and including, Kootenay Lake.

It is intended that this report serve as a companion document to an interim report of the Bureau of Sport Fisheries and Wildlife of the U.S. Fish and Wildlife Service on project effects on fish and wildlife resources within the United States, scheduled for early release.

Complete engineering data from the Corps of Engineers were not available for consideration in this report; Hence, the material presented may be subject to considerable alteration and refinement prior to scheduled release of a detailed report on Libby project in May 1964.

Information relating to project effects on fish and wildlife has been developed jointly by the Libby Project Working Committee, which is responsible for field studies and data compilation, and the Libby Project Planning Committee, which is responsible for overall planning for the full development of the resources involved. Each of these groups is composed of designated personnel of the British Columbia Fish and Game Branch, the Canadian Wildlife Service, the Montana and Idaho Departments of Fish and Game, and the Bureau of Sport Fisheries and Wildlife of the U.S. Fish and Wildlife Service. In addition, the U.S. Forest Service and the U.S. Army Corps of Engineers are represented on the planning committee.

Material contained in this report does not necessarily have the full concurrence of all members of the planning committee. There have been questions raised as to whether all measures recommended for the United States' portion of Libby project can be included as part of this water resource development.

## INTRODUCTION

### Purpose of the Project

Libby Dam and Reservoir will be a flood control and power project. The project is a major feature of the comprehensive plan for development of the Columbia River Basin in the interests of flood control, power generation, and related water uses.

## Location of the Project

Libby Dam and Reservoir will be located on the Kootenai River in northwestern Montana and southeastern British Columbia. Location of the dam has not been definitely established; however, studies by the Corps of Engineers have narrowed the number of sites being considered to three, all located in a 2-mile reach of the river between mile 217.0 and 219.0. Information presently available indicates the dam probably will be built on the Kootenai River at Souse Creek site, river mile 219.0, about 17 miles upstream from Libby, Montana. The reservoir will extend 42 miles into Canada to about one-fourth mile downstream from the mouth of the Bull River.

## DESCRIPTION OF THE BASIN

The Kootenai River (Kootenay in Canada) originates near the west boundary of Kootenay National Park in British Columbia. The river flows in a southerly direction through a portion of the park and after being joined by the Palliser, White, Lussier, St. Mary, Bull, and Elk Rivers, it enters the United States near Gateway, Montana. The Kootenai is joined by the Tobacco River near Rexford, Montana, and continues south to Jennings near the confluence of the Fisher River, where it assumes a westerly direction to the Montana-Idaho border. Three major tributaries entering this reach of river in Montana are Libby and Lake Creeks, and the Yaak River (Yahk River in Canada). About 6 miles west of the Montana-Idaho State line, the Kootenai River is joined by the Moyie River. At Bonners Ferry, Idaho, the Kootenai River turns north and follows a meandering course, through the

flat bottomlands known as Kootenai Flats, for about 50 miles to the head of Kootenay Lake in British Columbia. Kootenay Lake occupies about 65 miles of the length of the Purcell Trench. The lake ranges from 1 to 4 miles in width and has a maximum recorded depth of 506 feet. Kootenay River emerges from the West Arm of the lake near Nelson, British Columbia, and flows southwesterly to the Columbia River near Castlegar, British Columbia. The Kootenai River has a total length of 464 miles, of which 299 miles lie in Canada. It drains an area of 4,800 square miles in the United States and 14,500 square miles in Canada.

## PLAN OF DEVELOPMENT

Libby Dam and Reservoir will provide storage for flood control, power generation, and related water uses. The project is expected to greatly reduce flooding of cultivated lands in the Kootenai Flats area between Bonners Ferry, Idaho, and Kootenay Lake, British Columbia. It will also contribute to flood control along the Lower Columbia River.

Present engineering data indicate that a concrete-gravity dam will probably be constructed on Kootenai River at Souse Creek site (river mile 219.0). It will be about 360 feet in height above streambed, with a crest length of about 3,055 feet. Freeboard above the maximum operating pool will be about 13 feet. The ogee-type spillway will have a crest elevation of 2,410 feet and a capacity of 135,000 second-feet. Flow over the spillway will be controlled by taintor gates. Six permanent sluices will be installed through the spillway section to enable drawdown for flood control. Each gate will be 10 feet wide by 12.5 feet high.

The hydropower plant, located on the left bank near the dam, will have an initial installation of four turbines and a plant capacity of 374,000 kilowatts. The intakes will have a diameter of 17 feet and an invert elevation of 2,222 feet. Provisions will be made for four additional turbines to be added in the future. The ultimate plant capacity will be 748,000 kilowatts unless there are Canadian diversions of water upstream. Peaking operations will occur all year but will be greater during the winter months. Minimum discharge of the Kootenai River generally occurs from November through March. With Libby project in operation, the minimum flows will generally occur from May through September. Minimum sustained-flow release at Libby Dam will be about 2,000 second-feet. Such flows will also be provided during the construction period and during generator testing.

During May through September, the powerplant will generally operate on scheduled low loads, and maximum changes in releases will be limited to about 1-foot changes in stage per hour. During October through April, the change in stage will be about 1 foot per 30 minutes. Changes in stage could occur at any time of day but normally will be between 6:00 a.m. and 5:00 p.m..

During November through March, when maximum peaking capacity will be utilized, the extreme daily change in stage will be 8 feet at the dam. Normally, the maximum daily change in stage will be about 6 feet at the dam, which will result in a daily fluctuation at Bonners Ferry of not more than 2 to 3 feet and about 1 foot at the Canadian border, depending upon the level of Kootenay Lake.

Libby Reservoir will be approximately 90 miles in length, backing water 42 miles into Canada or to a point about 3 miles upstream from Wardner, British Columbia. Estimated average annual reservoir drawdown for the life of the project is (1) 60 feet per year for the first 15 years and (2) 40 feet per year for the remainder of the 100-year period of project life. The amount of reservoir spilling will be based on runoff forecasts and would be controlled so that total flow at Bonners Ferry will not exceed about 60,000 second-feet. Based on Corps of Engineers' studies, sluice gates will be used for spilling about 14 percent of the years during the life of the project. Drawdown will occur during fall and winter months and refill during spring and summer months. Pertinent reservoir data are shown in table 1.

Table 1. Libby Reservoir Data

| Item | Elevation (Ft. m.s.l.) | Capacity 1/ (acre-feet) | Surface 1/ Area (acres) | Normal Operating 1/ Pool Length (miles) |
|---|---|---|---|---|
| Normal operating pool | 2,459 | 5,985,000 | 47,800 | 90 |
| Minimum operating pool | 2,287<br>172' | 975,000 | 15,000 | 42 |

1/ Based on dam being located at river mile 217.0. Minor changes would apply to siting of dam at mile 219.0.

Most of the land required in the United States by Libby project consists of a few small farms and timbered and cutover lands along Kootenai River. In addition, the reservoir will require the relocation of about 70 miles of the Great Northern Railway which presently follows the east bank of

the river, nearly 60 miles of Montana State Highway 37 which parallels the railroad on the west bank of the river, communities of Warland, Rexford, and Stonehill, and portions of county and U.S. Forest Service roads, ranger stations, and work camps, as well as telephone and power lines.

In Canada, the community of Waldo will be affected, and sections of a branch-line railroad and several roads will need to be relocated.

Included in project cost estimates are facilities for accommodating visitors at the damsite and for developing recreational facilities.

# FISH (UNITED STATES)

## The Resource and Problems

Libby Reservoir, at normal full-pool elevation 2,459 feet, will inundate about 48 miles of the Kootenai River and several miles of tributaries in Montana which presently support populations of game fish. Principal game fish in the streams within the reservoir site in Montana are cutthroat, Dolly Varden, brook, and rainbow trout, and mountain whitefish. Nongame fish include squawfish, suckers, and peamouth. Burbot, considered a nongame fish in Montana, also inhabit the Kootenai River in the reservoir site.

Stream habitat in the project area will be replaced with a reservoir having an average annual fluctuation of about 60 feet for the first 15 years, and 40 feet per year for the remainder of the 100-year project life. Maximum fluctuation will be 172 feet. Reservoir fluctuation will virtually eliminate effective trout spawning in the reservoir. Natural reproduction of trout and subsequent recruitment to the reservoir will depend upon remaining spawning habitat in tributary waters. Streams tributary to the reservoir site in Montana are of small size and few in number. Natural reproduction will not provide the numbers of trout needed to sustain a reservoir fishery. The good winter fishery for mountain whitefish will also be virtually eliminated.

Nongame fish are expected to increase greatly in the environment created by the reservoir. These fish will find suitable spawning habitat in the reservoir as well as in some tributary streams.

Following a period of about 5 to 7 years or sooner, nongame fish are expected to dominate reservoir fish populations. In addition, increased encroachment in tributary streams by nongame fish is expected as their numbers increase in the reservoir.

Downstream from Libby Dam, physical and biological characteristics of the fish habitat in the Kootenai River and some of its tributaries will be altered. In addition to the other fish species listed previously for streams in the reservoir site, the white sturgeon occurs in Kootenai River downstream from Kootenai Falls, Montana (figures 1 and 2). This species is unusual in that state. Other species of fish listed for the Kootenai River in Idaho include kokanee, sunfish, yellow perch, redside shiners, and longnose dace. Occurrence of the burbot in the Kootenai River in Idaho is unusual.

As a result of wide daily river level fluctuations, fisherman use will be hampered, fish will be stranded, and aquatic fishfood organisms will be reduced. The temperature of water released from the reservoir will be cold (estimated 45° F. or lower) throughout most of the year. The dam will also block upstream movement of fish and eliminate some recruitment of game fish from upstream spawning areas to the lower river. During the construction period, considerable sediment, and possibly other pollutants, will be discharged to the river.

Relocation of the Great Northern Railway will result in extensive channel changes along the Fisher River and Wolf Creek. Stringent relocation specifications and the narrow valleys being followed will result in virtual

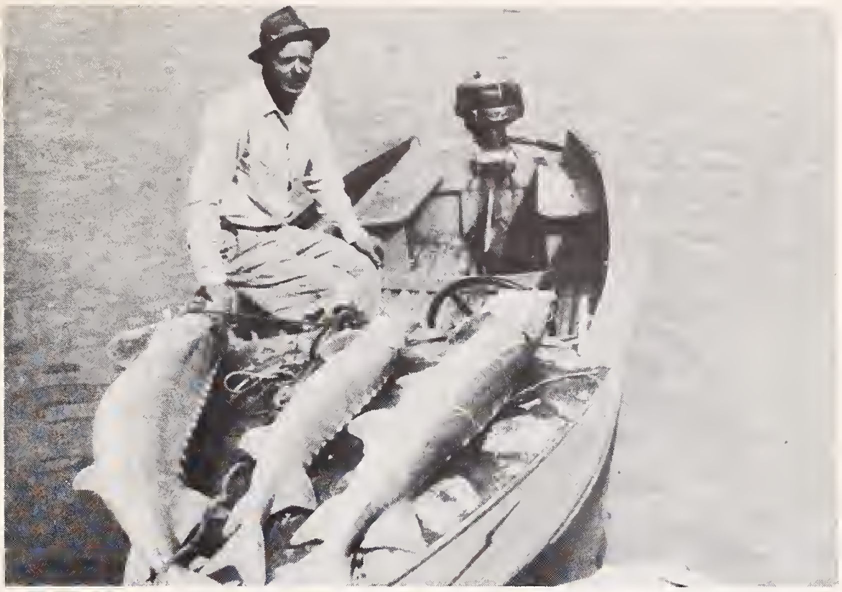


Figure 1. Kootenai River is the only stream in Montana inhabited by white sturgeon. This large fish is prized by Kootenai River anglers in Idaho and Montana. (Photo courtesy Idaho Department of Fish and Game).

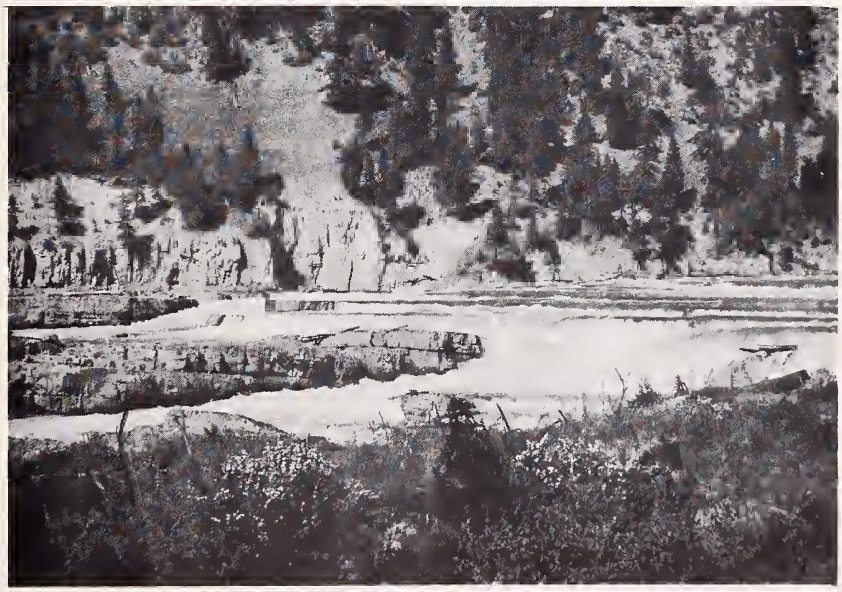


Figure 2. Kootenai Falls in Montana is believed to be the upstream limit for white sturgeon on Kootenai River; however, this cataract is considered only a partial barrier to movements of other fishes. (Photo courtesy Bureau of Sport Fisheries and Wildlife).

destruction of the lower 12 miles of the Fisher River. Wolf Creek will not be so drastically altered. Relocations will straighten channel sectors, eliminate streambank vegetation, create access problems, increase siltation, destroy trout spawning areas, and block fish passage.

Limited information available on the fishery of the Kootenai River and tributaries in Montana and Idaho presents a problem in any detailed evaluation of the effects of Libby project on the fish resources involved. Additional studies are needed to fulfill requirements in report preparation and to justify and support recommendations.

## Discussion

Valuable trout habitat exists in Cripple Horse, Five Mile, Big, and Pinkham Creeks, and the Tobacco River (figure 3). Although portions of these tributaries will be inundated, remaining reaches will require protection from encroachment by nongame fishes from the reservoir. Barriers should be constructed on these tributaries just upstream from maximum reservoir pool level to block upstream migrating fishes. The barriers would be designed to include short fish ladders and trapping and sorting facilities (appendix I). These structures would provide a means of separating game fish from nongame species. Game fish could then be allowed to continue their upstream migration to spawning areas. Uninterrupted downstream passage of these fish and their progeny would be possible. Nongame fish migrants would be controlled at the barriers. The estimated cost of these structures is $61,000.

It has been proposed by the Montana Department of Fish and Game that initially only two of these barriers would be constructed (on the Tobacco

River and Big Creek). Evaluation of their effectiveness would be determined by the proposed 8-year postimpoundment studies. Seasonal sorting operations, designed to coincide with spawning migrations, would be undertaken. A stocking and tagging program would also be initiated to develop runs of cutthroat trout between the reservoir and the tributaries. The need for construction of the remaining barriers would be based upon the evaluation of the effectiveness of the two initial installations.

The drainages of Cripple Horse, Five Mile, Big, and Pinkham Creeks, and the Tobacco River drainage, located upstream from the recommended barrier structures, should be improved, managed, and protected to assure maximum trout production. Improvement would include removal of obstructions such as log jams, renovation of improperly constructed dirt road structures which cross streams, streambank protection, and fencing. In addition, some of these streams already infested with undesirable fish species would have to be treated to eliminate existing fish populations. Management measures would include a program of continuing studies, together with law enforcement, and restocking. Watershed protection measures would be needed to assure survival of this stream habitat. The U.S. Forest Service policy of maintaining streambank vegetation for 66 feet or more on either side of streams is an excellent example of good watershed protection. Pollution problems exist along the Tobacco River which must be overcome to assure maximum use by trout of this river system. Measures designed to protect and improve these stream fisheries would also improve the reservoir fishery. The cost of stream improvement and eradication of undesirable fish is estimated to be $140,000.

Operation and maintenance costs of barriers and stream improvement facilities are estimated at $2,000 annually and are considered to be a responsibility of the project.

Libby Reservoir, with its fluctuating water levels, will not provide suitable spawning habitat for trout. Tributaries will provide some spawning areas for trout reared in the reservoir. However, the tributaries are small and few in number and recruitment of fish to the reservoir from these streams will not be adequate. Large plants of hatchery-reared cutthroat trout would be necessary during initial years of the project to provide a reservoir fishery. The value derived from stocking the reservoir is expected to be greatest during the initial years of the project. Following this period, nongame fish domination of the reservoir habitat will drastically reduce the value of artificial stocking. Existing Federal and State hatcheries in Montana will assume responsibility for rearing cutthroat trout to stock these waters at project costs. Large numbers of cutthroat trout would be stocked annually for the first 3 years following initial storage of water in the reservoir. [The desirability of stocking fish in the reservoir beyond this period will have to be determined by postimpoundment studies.] Agencies involved in stocking the reservoir should be advised at least 3 years prior to the completion date of Libby project in order that provisions can be made for the increased hatchery production that would be required. The cost of providing cutthroat trout for stocking Libby Reservoir during its initial 3 years should be a project responsibility. The estimated cost of stocking the United States' portion of the reservoir for 3 years is $276,000.

The fishery of Kootenai River from Libby Dam downstream, to and including Kootenay Lake in Canada, could be significantly damaged by project operations. To reduce downstream damages resulting from periods of low flow, it will be necessary to provide a sustained flow comparable to the February mean monthly flow at the damsite. Available records indicate that this release should approximate 2,500 second-feet. This flow should also be provided during initial filling of the reservoir and during periods of generator testing.

River levels downstream from Libby Dam will fluctuate widely during power-peaking periods, and spawning conditions for fish will be adversely affected (figure 4). Fishermen will encounter considerable danger from fluctuating river levels. In addition, rapid drawdown of river levels will result in some stranding of fish and fishfood organisms. During power-peaking operations, the rate of change in releases should be made as gradually as possible to minimize these effects. A rate of change in water levels of Kootenai River, downstream from Libby Dam, should not exceed 1 foot per hour as measured at a point just upstream from the confluence of the Fisher River.

The temperature of water released to the Kootenai River from Libby Reservoir is expected to be cold. Water will be drawn from the reservoir through penstocks and sluices with intakes located about 170 feet below normal full pool level. The impact of this cold water upon downstream fish habitat and species of fish inhabiting these waters has not been fully determined as yet. There are advantages and disadvantages to having cold water released from Libby Reservoir. Low water temperatures will

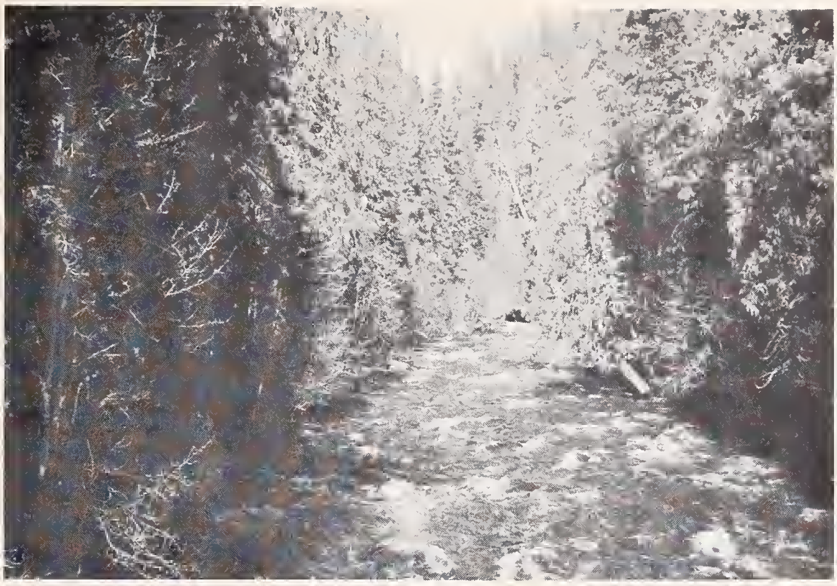


Figure 3. Tributaries to Kootenai River in the reservoir site, such as Big Creek (pictured), will require protection against undesirable non-game fishes and should be improved as spawning habitat for trout. (Photo courtesy Bureau of Sport Fisheries and Wildlife).

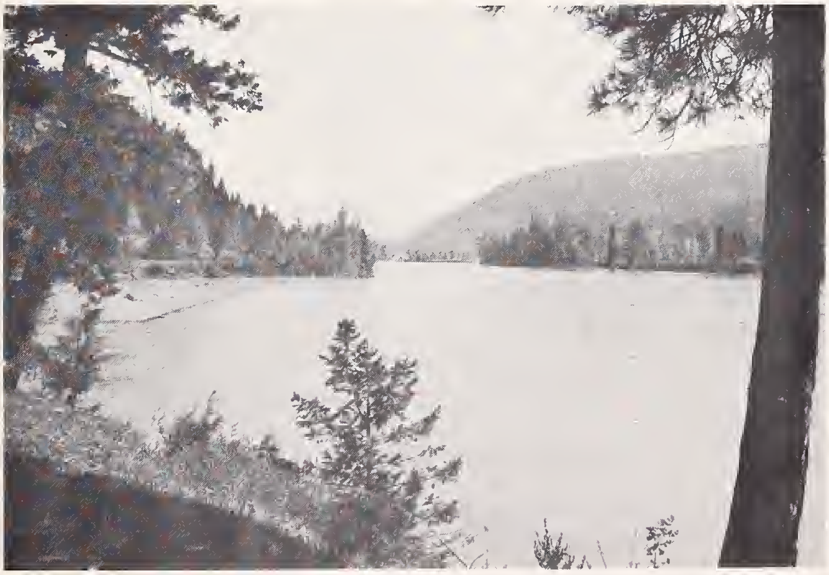


Figure 4. With operation of Libby project, Kootenai River levels downstream will fluctuate widely, thus affecting fish habitat and creating hazards to anglers. (Photo courtesy Bureau of Sport Fisheries and Wildlife).

reduce the growth rate of fish in the Montana sector of the river. Farther downstream in Idaho and Canada, low water temperatures will benefit the existing fishery by retarding the distribution and abundance of yellow perch, sunfish, and some nongame species. Although additional water temperature studies are needed to determine the rate at which this water will warm as it travels downstream, an estimated temperature range during the spring and summer of 50° to 65° F. at Bonners Ferry, is considered desirable. The Corps of Engineers has agreed to conduct temperature studies and investigate the possibility of providing desired water temperatures downstream from Libby Dam.

The adverse impact of Libby project railroad and highway relocations on the fishery of the area will be considerable. The Corps of Engineers has indicated that bridges or box-type structures will be provided at highway relocations which cross streams of importance to trout. Because of tight specifications and narrowness of valleys being followed, railroad relocations will result in channel straightening, removal of bank vegetation, erosion problems, and reduced access along the Fisher River and Wolf Creek (figure 5). The fish habitat in the lower 12 miles of the Fisher River will be virtually destroyed. Somewhat less impact will occur along Wolf Creek and possibly Fortine Creek. Biologists should view construction activity from day to day and recommend to the construction agency various possibilities that may exist for minimizing fish losses. A program of stream improvement should be undertaken to alleviate damages resulting from relocation of the railroad. In addition, streambank vegetation should not be disturbed and denuded areas should be revegetated as soon

as possible. Access to the stream should also be assured by construction of turnouts at regular intervals along relocation routes.

Borrow material needed for construction of the dam should be obtained from a source other than the Kootenai River channel. Disturbance of the channel by excavation could cause considerable turbidity downstream. Effects of turbidity on downstream fish habitat could be minimized provided channel disturbance is conducted during high-water periods.

Postimpoundment studies would be needed to determine possible means of controlling nongame fish, or certain species of nongame fish, in the reservoir. In addition, other biological studies should be undertaken to evaluate and determine a satisfactory fishery program for the reservoir and its associated streams. These studies would be coordinated with complementary studies conducted in Canada. Imposition of this reservoir, in an area which previously required a minimum of management responsibility, creates an added burden for the Montana Department of Fish and Game. These studies would enable this agency to assume responsibilities for managing the fish resources of the United States' portion of the reservoir for the remaining portion of the 100-year life of the project. These postproject studies should be conducted over an 8-year period following initial filling of the reservoir. The estimated gross cost of these studies is $192,000.

Recommendations (United States)

It is recommended:

1. That barrier dams, complete with fish ladders, and trapping and sorting facilities, be constructed on Cripple Horse, Five Mile, Big, and Pinkham Creeks, and Tobacco River and other designated tributaries in Montana. Cost of installation, operation, and maintenance of these structures should be assigned to the project.

2. That necessary stream improvement and fish eradications be undertaken on Cripple Horse, Five Mile, Big, and Pinkham Creeks, and Tobacco River. Project funds should be provided for carrying out these measures.

3. That Libby project provide funds for a period of 3 years, following initial filling of the reservoir, for use in obtaining cutthroat trout for stocking the United States' portion of the reservoir. Following this period, the need for additional stocking will be determined by Montana Department of Fish and Game.

4. That the project provide for a sustained release of 2,500 second-feet in Kootenai River downstream from Libby Reservoir.

5. That the rate of change in Kootenai River water levels downstream from Libby Dam be no greater than 1 foot per hour as measured at a point just upstream from the confluence of Fisher River.

6. That U.S. Army Corps of Engineers investigate the possibility of releasing water from several depths in Libby Reservoir to maintain 50° to 65° F. water temperatures in Kootenai River during spring and summer months as measured at Bonners Ferry, Idaho.

7. That relocated railroad or road-crossing structures on streams be of a type that would not impede fish passage. Cost of this program

should be determined by U.S. Army Corps of Engineers and incorporated in Libby project costs.

8. That stream channel straightening resulting from relocation be held to a minimum and performed where necessary; close liaison be maintained between contractors and fish and wildlife agencies when streams are straightened or when fills, bridges, or culverts have to be made or constructed. Structures to be installed in channel changes should be designed to maintain original current velocities and pool grades; access turnouts should be provided at regular intervals along the relocation route.

9. That erodable areas resulting from Libby project construction and railroad and highway relocations be revegetated, where possible, as soon as they have fulfilled the needs of the project.

10. That borrow material for Libby Dam construction be obtained from sources outside of the high-water channel of Kootenai River, and all construction activities associated with the project be accomplished in a manner which will minimize siltation and pollution of streams.

11. That a program of investigations designed to evaluate the impact of Libby Reservoir on the fishery, develop methods of controlling non-game fishes, determine reservoir-stocking requirements, locate and re-establish spawning runs, etc., be activated by Montana Department of Fish and Game following formation of Libby Reservoir and continued for a period of 8 years. Cost of this program should be considered a project responsibility.

# FISH (CANADA)

## The Resource and Problems

Libby Reservoir, at normal full pool elevation 2,459 feet, will inundate about 42 miles of Kootenay River in Canada and about 12 miles of important tributaries. A list of known fish species which will be influenced by Libby project is shown in table 2.

Table 2. List of Known Fish Species in Area to be Flooded by Libby Project, Canada

| GAME FISH | |
|---|---|
| Common Name | Scientific Name |
| Cutthroat Trout | Salmo clarki lewisi |
| Dolly Varden Trout | Salvelinus malma |
| Brook Trout | Salvelinus fontinalis |
| Rainbow Trout | Salmo gairdneri |
| Mountain Whitefish | Prosopium williamsoni |
| Burbot | Lota lota |
| NONGAME FISH | |
| Common Name | Scientific Name |
| Northern Squawfish | Ptychocheilus oregonensis |
| Peamouth Chub | Mylocheilus caurinus |
| Largescale Sucker | Catostomus macrocheilus |
| Longnose Sucker | Catostomus catostomus |
| Redside Shiner | Richardsonius balteatus |
| Longnose Dace | Rhinichthys cataractae |
| Prickly Sculpin | Cottus asper |
| Slimy Sculpin | Cottus cognatus |

Libby Reservoir, with a maximum fluctuation of 172 feet, would not provide habitat in which game fish could spawn. Natural reproduction of game fish in the reservoir would be limited by ① inadequate circulation of water, ② water-level fluctuation, ③ turbidity, and ④ competition from nongame fishes. Nongame fishes could be expected to flourish in the reservoir and would compete with game fish for food, prey on the young, and eventually dominate the habitat. Fishing success for game fish would decline rapidly following the initial years of the project.

Reservoir operation indicates that during most years, full pool would be maintained from June through the latter part of September. Drawdown would begin in late September and reach minimum pool about March. About 150 feet of drawdown would dewater the Canadian portion of the reservoir. Extensive mudflats would persist throughout much of the September through April period. There would also be years when the reservoir would not fill. During drawdown, the barren reservoir area would continue to be traversed by the Kootenay River and tributaries. These streams would meander through deposits of silt laid down during full pool period and the water would at times be very turbid. Little, if any, fishery value would remain in the temporarily flooded portions of these streams. Excellent stream fishing for cutthroat trout, Dolly Varden trout, mountain whitefish, and burbot would be lost and the fishery replaced with a reservoir of doubtful fishery value. Fisherman use of the reservoir is expected to be much lower during the life of the project than that which would occur on the river system without the project.

Streams tributary to the reservoir, including a portion of the Kootenay drainage upstream, will be subjected to serious encroachment by undesirable reservoir fishes.

## Discussion

Excellent fishing for cutthroat trout, rainbow trout, Dolly Varden trout, mountain whitefish, and burbot exists in the tributaries to Libby Reservoir. Principal tributary streams affected by the project are Gold, Kikomun, Linklater, and Sand Creeks, and the Elk River. Although about 11.4 miles of these streams will be inundated, abundant spawning grounds occur in remaining reaches located above the flood line. The remaining stream habitat will require protection against encroachment by nongame fish from the reservoir, which could be accomplished by the construction of barriers on these streams or their tributaries. In addition, fish ladders and trapping and sorting facilities should be incorporated in these barriers (see appendix I). These structures would provide a means of separating game fishes from nongame species. Game fish could then be placed in the tributaries above the barriers and allowed to migrate to upstream spawning areas. Uninterrupted downstream passage of fish to the reservoir would be possible. Nongame fish migrating upstream could be controlled at the barriers, thus reducing their numbers in the reservoir. Seasonal sorting operations, designed to coincide with spawning migrations, could be undertaken. The structures could also be used to assist future studies, such as tagging programs, etc. The estimated gross costs of barrier dams and associated facilities is $105,000.

The drainages of Gold, Kikomun, Linklater, Big Sand, and Little Sand Creeks, and the Elk River, located above the proposed barrier structures, should be improved, managed, and their watersheds protected to assure maximum trout production. This would partially compensate for stream fisheries lost by inundation. Improvement may include the elimination of obstructions, thus providing access by fish to all available spawning areas. Portions of streams infested with undesirable fish species may require rehabilitation. Management measures should include a program of continuing studies, together with law enforcement and restocking. Watershed protection measures will be needed to assure survival of the stream habitat. Protection measures should include the establishment of coordinated policies and practices to protect streams. Problems of erosion, mechanical damage, and pollution may occur without proper planning. Measures designed to protect and improve tributary habitat will also result in some improvement during initial years in the reservoir fishery. The estimated gross costs for stream improvement and fish eradication on these tributaries is $15,000.

Bull River enters the Kootenay near the upper end of Libby Reservoir. An abandoned dam, located on Bull River about 1 mile above the mouth, is a barrier to upstream migrating fishes. Contamination from the reservoir by nongame fish would occur only in the lower mile of the Bull River. The fish loss in this tributary would be small; however, considerable spawning habitat exists above the dam. This habitat could be made available for trout, thereby replacing some of the spawning habitat lost in the Kootenay drainage through construction of the project. The abandoned

dam would have to be bypassed by a fish ladder with trapping and sorting facilities. With the upstream spawning area accessible, a larger number of fish would be produced for downstream recruitment to the Kootenay River system and also Libby Reservoir. The estimated gross cost of this fish ladder and associated facilities is $30,000.

Libby Reservoir is expected to provide fair fishing during the initial years of the project provided large numbers of cutthroat trout are stocked in the reservoir. Following this period, the reservoir fishery is expected to decline rapidly due to domination by nongame species and reduced fertility of the reservoir. Fluctuating water levels will handicap fisherman use of the reservoir. The loss of an excellent fishery supported by the Kootenay River and its tributaries far exceeds the value of the expected reservoir fishery. To mitigate for this loss to the fishery of Kootenay basin, other waters should be developed to support displaced fisherman use. Numerous lakes exist in the basin which presently receive light fishing pressure due largely to inadequate access. Access to Edwards, Loon, Baynes, Surveyors, Suzanne, North Star, Rosen, Wapiti, Tie, and Moyie Lakes should be provided. A program of fish eradication, artificial stocking, and habitat improvement would further increase fisherman use on these lakes. Suitable access could be provided to these lakes at an estimated gross cost of $21,000. Fish eradication, stocking, and habitat improvement could be provided at an estimated gross cost of $76,000.

Operation and maintenance costs of barriers, stream improvement facilities, and access roads are estimated to be $1,700 annually.

Large numbers of trout will be needed to stock Libby Reservoir and adjoining waters in the Kootenay basin of Canada. To provide these fish, a fish hatchery is needed in the basin at the Bull River hatchery site, which is located in the vicinity of the waters to be stocked. Funds have recently been provided by the Canadian Government to begin construction of this hatchery. This site is located on Norbury Creek near the mouth of Bull River and the upper end of Libby Reservoir. The British Columbia Fish and Game Branch presently owns 190 acres of land and water rights on the flow of Norbury Creek. Wells may also have to be developed to supplement the water supply for this hatchery. Production from this hatchery could provide the necessary numbers of cutthroat trout needed to stock Libby Reservoir during the initial 3 years of the project. Following this 3-year period, production at the Bull River hatchery would be diverted to other waters of the basin to offset the loss of fisherman use encountered through construction of Libby project. Because of the impact of Libby project on fishery of the basin, the Bull River hatchery should receive funds for stocking Libby Reservoir from money derived from Libby project. The estimated gross cost of stocking the Canadian portion of Libby Reservoir for 3 years is $162,000.

Clearing of all trees and shrubs will be needed to assure safe and unhampered use of the reservoir by boat and shore fishermen. Past experience in uncleared reservoirs of this type has shown that floating debris and submerged timber have proven dangerous to boating and deleterious to the proper use of the fishery resource. The estimated gross cost of reservoir clearing should be determined by the British Columbia Parks

Branch of the Department of Recreation and Conservation. Funds for accomplishing this measure should be derived from Libby project.

Postimpoundment studies should be undertaken to determine means of controlling nongame fish populations in the reservoir. Other biological studies would also be needed to determine a satisfactory management program for the reservoir and its associated tributary streams. These studies would complement similar studies conducted in the United States' portion of the impoundment. Postproject fishery studies should be conducted for a period of 8 years following the initial filling of the reservoir. The estimated gross cost of these studies is $180,000.

## Recommendations (Canada)

It is recommended:

1. That barrier dams, complete with fish ladders, and trapping and sorting facilities, be constructed on Gold, Kikomun, Sand, and Linklater Creeks, and the Elk River or their tributaries. Location and design of these structures to be determined by appropriate Canadian agencies. Funds derived from Libby project should be used to construct these structures.

2. That necessary stream improvement measures and fish eradications be undertaken on Gold, Kikomun, Sand, and Linklater Creeks, and the Elk River or their tributaries. Funds derived from Libby project should be made available to the British Columbia Fish and Game Branch to accomplish these measures.

3. That a fish ladder, and trapping and sorting facilities, be constructed to circumvent the existing abandoned dam which is located about 1 mile upstream from the mouth of Bull River. Funds derived from Libby project should be used to construct these facilities.

4. That access roads be constructed to Edwards, Loon, Baynes, Surveyors, Suzanne, North Star, Rosen, Wapiti, Tie, and Moyie Lakes. Funds derived from Libby project should be provided to appropriate Canadian agencies for construction of access roads.

5. That necessary habitat improvement and rehabilitation measures be undertaken on Edwards, Loon, Baynes, Surveyors, Suzanne, North Star, Rosen, Wapiti, Tie, and Moyie Lakes. Funds for accomplishing these measures should be provided to the British Columbia Fish and Game Branch from moneys derived from Libby project.

6. That the project provide funds over a period of 3 years, following completion of the reservoir, for use in obtaining cutthroat trout for stocking Libby Reservoir.

7. That the reservoir area be completely cleared of all trees and shrubs according to specifications laid down by the Parks Branch of the Department of Recreation and Conservation, and that funds for reservoir clearing be derived from Libby project.

8. That a program of investigations designed to evaluate the impact of the reservoir on the stream fishery, develop methods of controlling nongame fishes, determine reservoir stocking requirements, locate and/or reestablish fish spawning runs, etc., be activated following initial filling of Libby Reservoir and continued for a period of 8 years. Funds for these studies should be derived from Libby project.

# WILDLIFE (UNITED STATES)

## The Resource and Problems

Libby Dam and Reservoir will have considerable influence on wildlife resources in, and adjacent to, the project area. There will be the direct loss of wildlife habitat through creation of a reservoir, which will reduce wildlife numbers, impede big-game migrations, and complicate management of big-game and upland-game resources on adjacent areas. There will also be major effects on wildlife as a result of relocations of a railroad through big-game winter range and the downstream effects of project flood control operations, which will alter habitat for all wildlife groups, particularly waterfowl. These combined effects of the project will create a number of problems for Federal and State agencies concerned with management of wildlife resources.

Wildlife species which will be affected by the project include white-tailed and mule deer; mountain sheep; moose; elk; black bears; spruce, ruffed, and Columbian sharp-tailed grouse; several species of fur animals; and many species of waterfowl (figure 6).

Big-game population estimates within the United States' section of the reservoir site and adjacent drainages are made annually by personnel of the U.S. Forest Service. Population studies were also made by biologists of the Montana Department of Fish and Game during the winter of 1947-48. These estimates and studies indicate big-game populations to be approximately as follows: white-tailed deer, 1,450; mule deer, 1,800; mountain sheep, 170; Rocky Mountain elk, 300; and moose, 200. Principal browse

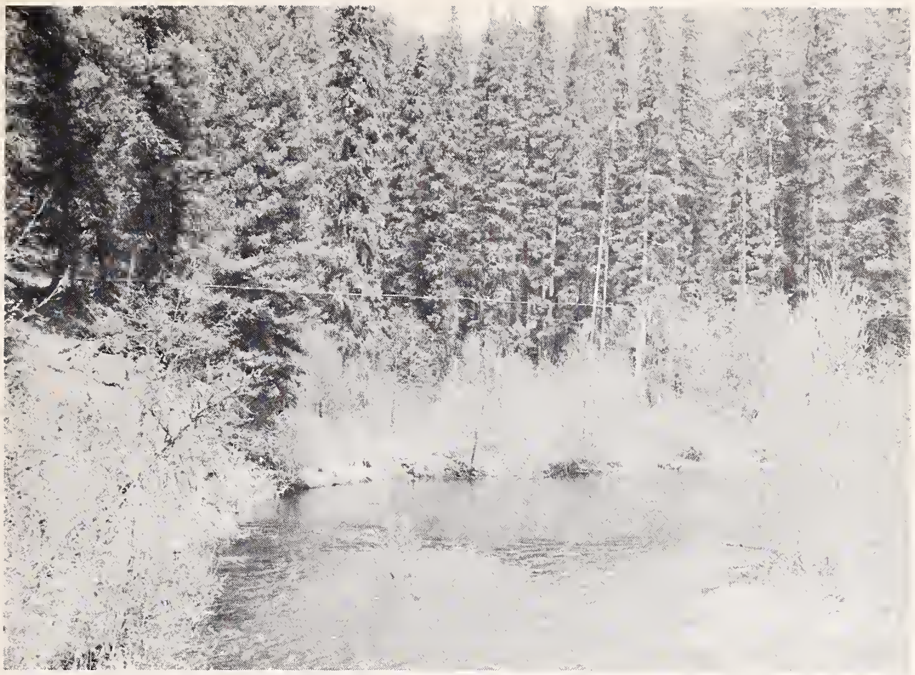


Figure 5. Relocation of the Great Northern Railway in the Fisher River-Wolf Creek drainages will create serious problems for fish and wildlife management agencies. Pictured stream is Wolf Creek. (Photo courtesy Bureau of Sport Fisheries and Wildlife).

Figure 6. Libby project area provides a variety of wildlife for hunters. This trophy mountain sheep ram was taken along Kootenai River between Warland and Rexford. (Photo used by permission of H. W. Kanzler, Columbia Falls, Montana).

species include serviceberry, chokecherry, snowberry, red-stem ceanothus, rose, willow, alder, ninebark, bitterbrush, nannyberry, cottonwood, and mountain maple. Bitterbrush is the predominant type occurring on the benchlands west of Rexford, Montana.

Deer winter range lost through inundation by Libby Reservoir will amount to about 14,000 acres. The area primarily consists of stream-bottom lands and low benchlands. During normal winters, these lands are used only lightly by big game; however, during critical winters, these lowlands become extremely important and can be the deciding factor in survival or drastic reduction of wintering herds. Because of this, it is necessary to evaluate the impact of the project in direct relation to the occurrence of such periods.

The extent of losses which will be incurred by these herds through inundation of winter range is not yet known. Some animals will seek out sustenance on adjacent forested lands. The population adjustment to the reduced habitat will result from starvation and will occur primarily during the first critical winter unless adequate measures are taken to alleviate these losses prior to construction of the project. Permanent reservation, development, and maintenance of remaining deer winter range is essential to partially compensate for habitat inundated by Libby Reservoir.

Since, with the project, there will be a reduction of available rangelands and displacement of ranches onto adjacent areas, considerable competition between livestock and big game is expected. Livestock-proof fencing of proposed wildlife ranges is considered a necessary management measure to provide a greater food supply during critical winter periods.

The relocation of the Great Northern Railway through the northern half of a major winter concentration area for white-tailed deer in the lower Fisher River-Wolf Creek drainages (referred to as Route 1) is considered to be a very serious aspect of this project. Substantial deer losses are expected to result from train kills since these animals, by nature, tend to seek out cleared areas for easier movement during periods of excessive snow depth. This is more common during late winter months when food has become increasingly scarce, and they have become weakened from depletion of stored body fats.

The proposed route would extend from the mouth of the Fisher River at Jennings upstream to the mouth of Wolf Creek, where it would turn east and extend up this drainage. Heaviest losses would occur in the Fisher River area and in about 8 miles of the Wolf Creek drainage. In addition to deer losses from train kills, there would be losses of winter range resulting from clearing of rights-of-way which will remove a large amount of the bottomland vegetation.

Mountain sheep rangeland adjacent to the reservoir is confined entirely to the east side of the Kootenai River and extends approximately from Cripple Horse Creek north to Sutton Creek in the vicinity of Beartrap Mountain. Recent population estimates place the herd at about 170 animals. The band, which is referred to as the Ural-Tweed herd, utilizes slightly less than 70,000 acres of summer range and about 27,000 acres of winter range within this area.

Studies indicate that approximately 3,500 acres, or 13 percent of the mountain sheep winter range, will be inundated by Libby impoundment. A population adjustment in relation to the remaining winter range will result after project construction. The true significance of the loss to mountain sheep should be evaluated in respect to the limited number of these animals remaining in the United States. In light of this, any loss of habitat or animal numbers can become quite significant and warrants consideration for establishment and protection of compensatory rangelands.

Among the upland-game species influenced by the project, it is expected that sharp-tailed grouse may be adversely affected through loss of essential prairie habitat. The prairie lands comprise an ecological niche which is unique in western Montana, and serve as a breeding ground for this species. Loss of such habitat will necessitate development and management of remaining prairie-land habitat suitable for these upland birds.

A wide variety of fur animals occurs in the project area of influence. Trapping of these animals is limited at present since pelt values are quite low. Beavers, minks, and muskrats provide most of the harvest. While the project will reduce the numbers of these animals in certain areas, specific measures have not been considered at this time since recommended improvements to other wildlife groups will, at the same time, generally provide improved habitat for fur animals.

One of the most significant wildlife problems associated with the project is the anticipated depletion of waterfowl habitat through flood control

improvement in the downstream Kootenai Flats area. Although some waterfowl-nesting habitat will be inundated by the reservoir, more serious will be the elimination of periodic flooding of the rich bottomlands in the Kootenai Flats area. Since elimination of flooding undoubtedly will be followed by more intensified agricultural development, a considerable loss of habitat is expected. About 400 acres of undrained marsh, 300 acres of semipermanent open water, and 200 acres of seep area remain in the valley. The marsh and seep areas support dense stands of cattails, large bulrush, horsetail, and sedges. The open-water ponds contain pondweeds, duckweed, musk grass, water smartweed, and arrowhead. Once extensive, the marshes have been greatly reduced through agricultural practices. The Corps of Engineers' continued diking program, coupled with Libby project flood control operations, will reduce or eliminate the few remaining wetland areas of value to waterfowl.

The importance of this area is demonstrated by the fact that the Idaho Department of Fish and Game places the Kootenai Valley, from Bonners Ferry to the international boundary, at the top of its priority list of proposed waterfowl development areas.

## Discussion

Wildlife Lands (Private Land Areas). Considerable attention has been given to locating potential areas susceptible to wildlife management and development, and which would partially compensate losses to wildlife resources. On the west side of the Kootenai River, in northwestern Montana, are 8 to 10 sections of critical deer winter range which, if acquired and adequately fenced, would lend themselves to management for

big-game animals (figure 7). This area is comprised of Federal and private lands, which could be incorporated into a wildlife management unit. If acquired, the private lands, totaling 1,761 acres, would be incorporated into the Kootenai National Forest, since they lie within the external boundaries of the forest. This would facilitate management of the area by the U.S. Forest Service. The proposed areas are shown on map No. 1.

The estimated value of the private lands is $50 per acre. Total land acquisition costs for the recommended 1,464 acres is $73,200.

Initial costs for drift fencing to protect the area against livestock trespass are estimated at $6,300. Annual operation and maintenance costs are estimated to be $1,260.

Another area which would be suitable for mitigation of wildlife habitat losses occurring as a result of the project lies east of the Kootenai River in the vicinity of Sophie Lake. This area includes several small lakes and glacial potholes. It supports scattered sections of nonmerchantable timber and grasslands, and is probably the last segment of natural prairie land in western Montana. These lands are used by deer and elk during critical wintering periods, by waterfowl during spring and fall migrations, and by sharp-tailed grouse as breeding grounds.

Acquisition of 4,978 acres of private lands, in addition to 555 acres of State land and 26 acres of public domain land, would permit management for these various wildlife species. The latter two acreages would be obtained by lease and withdrawal, respectively. It would be necessary

to fence the perimeter of the area as shown on map No. 1 to regulate livestock use.

The average estimated value of the privatelands is $65 per acre. Total acquisition costs for the recommended 3,431 acres is $223,015.

Initial fencing costs are estimated at $11,700. Estimated annual operation and maintenance costs are $2,340.

Portions of the private land areas, namely 297 acres west of the river and 1,547 acres east of the river, are presently proposed by the Corps of Engineers for recreational development to enhance a multiple-use program for sportsmen, campers, and for general recreation use. Such use probably would be compatible with wildlife purposes, since recreational activities would occur in a comparatively small area of the entire unit during summer months in contrast to winter use by big-game animals.

The area most suitable for mitigation of losses of mountain sheep range lies downstream from the community of Libby in the Kootenai Falls area. Limited numbers of mountain sheep occupy this and adjacent forested lands. If this area were acquired for wildlife management purposes, it could support a larger population of these animals and provide hunting to compensate for losses incurred by the Ural-Tweed herd. The four tracts of private land under consideration total 288.05 acres and are shown on map No. 2.

The estimated value of these lands is $270 per acre. Total acquisition cost for the recommended 288 acres is $77,760.

It is not anticipated that fencing or other facilities will be needed on this area.

Wildlife Lands (National Forest Areas). Where National Forest lands are involved, loss of big-game habitat would be mitigated through intensive multiple-use land management. It is preferred that lands used for this purpose lie within, or adjacent to, existing big-game winter range; be situated on south-facing slopes below 4,000 feet elevation; and support, at the present time, some amount of palatable browse species. Areas most favorable for such development occur in the open ponderosa pine-shrub habitat of the Warland Ranger District. Techniques employed for increasing carrying capacity of these lands would depend upon the location, present condition, and use by game and livestock. A practical technique which would provide benefits to timber and wildlife is thinning of pole stands to release browse (figure 8). This would open the forest canopy to permit light penetration and reduce competition for moisture and space. Continued thinning may be necessary on certain areas. Burning of slash would be encouraged where feasible to stimulate browse development. If this is not compatible with fire control, slash would have some value in providing moisture retention and protection for young browse plants. This would considerably reduce management costs. Stands of nonmerchantable Douglas fir and lodgepole pine would be left for escape cover and to provide the animals protection from severe weather conditions.

Eight areas within the Warland Ranger District which appear to be most suitable for this type of timber-wildlife management are named by location as follows: Canyon Creek, Cripple Horse Creek, Five Mile Creek, Valcour,

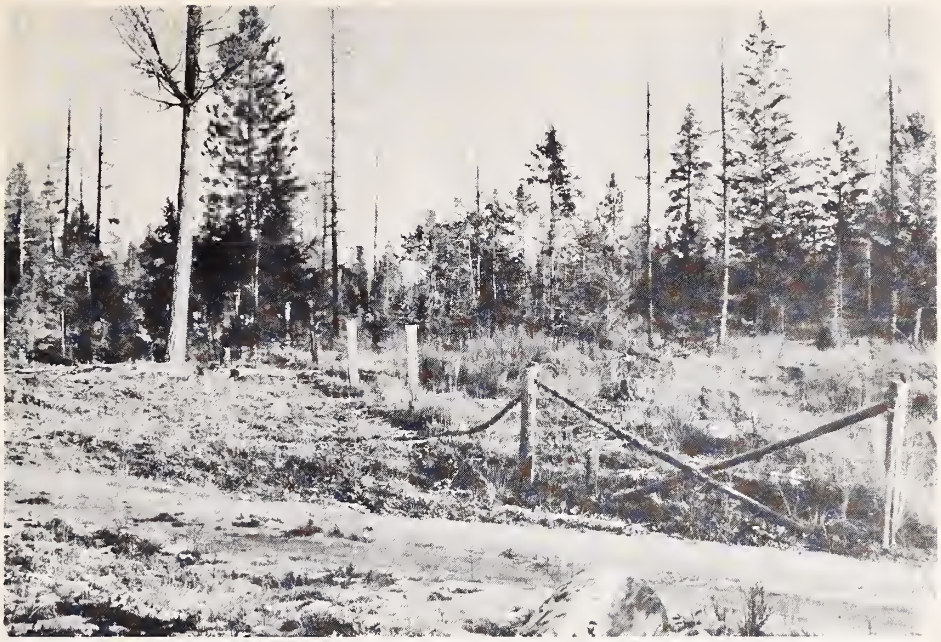


Figure 7. Fencing of proposed wildlife ranges is considered a necessary management measure to provide a greater food supply for big game. The area pictured shows excessive use outside the boundary fence. (Photo courtesy U.S. Forest Service).

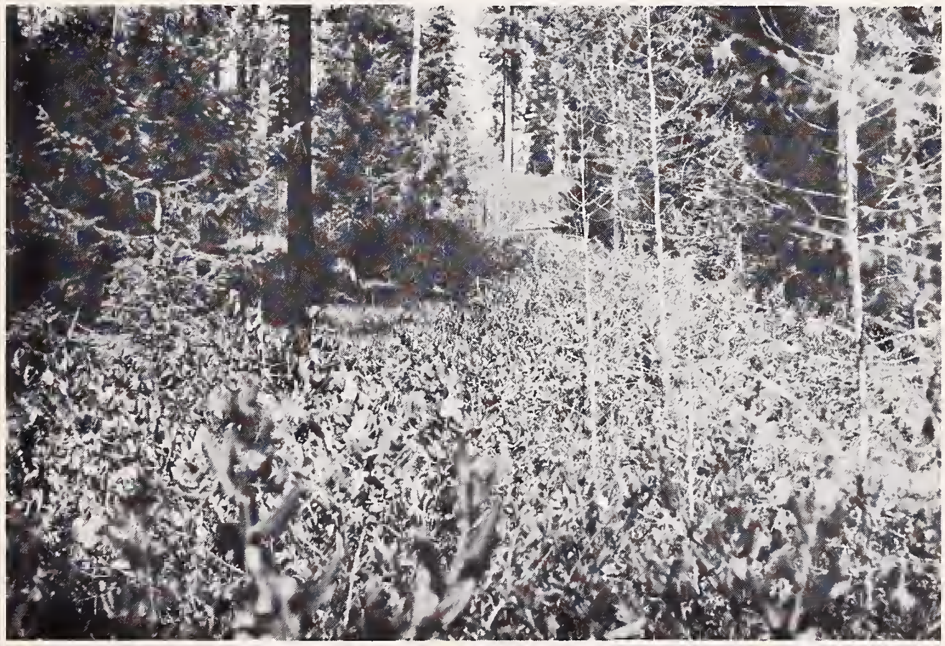


Figure 8. Opening the forest canopy to facilitate rapid browse growth is one technique which may be employed to increase big-game carrying capacity. The pictured area was logged in 1945 and a dense stand of snowbrush has resulted on an old skid road. (Photo courtesy U.S. Forest Service).

Tenmile Creek, Warex, Sheep Creek, and Barron Creek. These areas, which total 455 acres, are shown on map No. 3.

All eight of these areas, excepting a portion of the Warex tract, are National Forest lands. The southwest quarter of sec. 1, T. 33 N., R. 29 W., is presently under private ownership. The desired land parcel is approximately 60 acres in size. The estimated value of this land is $50 per acre. Thus, the acquisition cost is $3,000.

Initial costs for browse-release management measures on these areas are estimated at $50 per acre. This does not include slash disposal. Total initial costs for development and management to provide mitigation for losses of big-game winter range would be $22,750 for the 455 acres involved. These costs are considered a direct responsibility of the project.

In addition, it would be necessary to undertake continuing studies to investigate techniques to increase browse production in these areas. These studies may explore such problems as game-livestock competition and such measures as controlled burning, seeding, soil scarification, and various silvicultural methods to increase wildlife-carrying capacity. Estimated annual cost of such a program is $4,500 for a minimum period of 10 years. Total costs for studies would thus be $45,000.

Railroad Relocation. The proposed relocation route (known as Route 1) for the Great Northern Railway will present some serious problems for big-game resources. It will be difficult to prevent the loss of large numbers of deer expected to be killed by trains. In addition, the range

is considered to be in rather poor condition at present, and further loss of critical browse habitat by right-of-way clearing will aggravate the situation. A report on the impact of the Libby project on wildlife resources, by the Montana Department of Fish and Game, dated January 1955, devoted considerable attention to this problem. The report recommended that the railroad right-of-way be enclosed by deer-proof fencing for a distance of 22 miles and that cattle-type guards be situated at both openings of the fence. To facilitate migration of animals through the fenced area, big-game underpasses were recommended.

The practicability of deer-proof fencing and underpasses along this entire section is debatable. Both initial costs and continuing maintenance costs for this type of fencing are very high in proportion to the losses which may be prevented. The need for these structures or other devices designed to alleviate losses in this area should be determined following project completion. Once the relocations have been completed, however, the Government will no longer be responsible for operation and maintenance. Subsequently, financing of measures designed to minimize these losses will not be available.

Location of the railroad route on the shaded side of the drainages, where deer are less likely to congregate, would greatly reduce losses to this resource. This location would follow the west side of Fisher River drainage and the south side of Wolf Creek drainage.

There is no practical means of preventing deer losses with relocation of the railroad in these drainages. In addition, the Montana Department

of Fish and Game will be subjected to considerable public pressure to alleviate these big-game losses. The only solution in minimizing losses at this time appears to be relocation of the railroad along a different route, such as the Corps of Engineers' alternate route 4. Biologists should view construction activity on a day to day basis.

Waterfowl Habitat. It is considered highly important to prevent further depletion of waterfowl habitat in Kootenai Valley that will occur from operation of Libby project (figure 9). The valley has long been recognized as having considerable potential for waterfowl development, and the loss of this area could have serious effects on waterfowl populations in this segment of the Pacific Flyway.

In placing Kootenai at the top of their priority list of potential waterfowl development areas, Idaho Department of Fish and Game cites the following:

a. "Acquisition costs will increase greatly after Libby Dam is constructed. The present flooding and drainage problems in the irrigation districts near Bonners Ferry will be largely solved with the water control furnished by Libby.

b. "This proposed waterfowl development is on the direct line of a considerable portion of the wintering mallard flight out of Canada into eastern Washington, Oregon, and Idaho. It would be a major resting area for this flight in addition to furnishing considerable local production.

c. "Agricultural interests have been and are threatening removal of a highly important piece of waterfowl real estate at Duck Lake just

north of Idaho's portion of the Kootenai Valley. The Canadian Wildlife Service, British Columbia Wildlife Agency, and local Canadian sportsmen are actively engaged in a fight to maintain this area. The Bureau of Sport Fisheries and Wildlife could strongly support Canada's efforts in this area by initiating a major waterfowl development project in the Kootenai Valley of Idaho."

Habitat development should be directed toward restoring marsh conditions, where feasible, and cultivation of cereal grains. This would provide additional nesting habitat and a food supply to attract migrant birds. Cultivation of cereal grains would alleviate the depredation problems which sometimes occur in conjunction with waterfowl management programs.

The potential of these waterfowl development areas in Idaho, and the Duck Lake area in British Columbia, is highly significant and offers the best opportunity for enhancement of a wildlife resource with Libby project. Consideration should be given to the desirability of purchasing lands over and above those which would provide compensation for habitat destroyed. Cultivated lands strategically located through the valley would provide the necessary food for migrant birds. Ponded areas with controlled water levels, in addition to those existing, would provide natural foods and protected resting areas. The cumulative effects of a series of resting and feeding areas would facilitate waterfowl movement and provide protection and hunting opportunities during the fall hunting season.

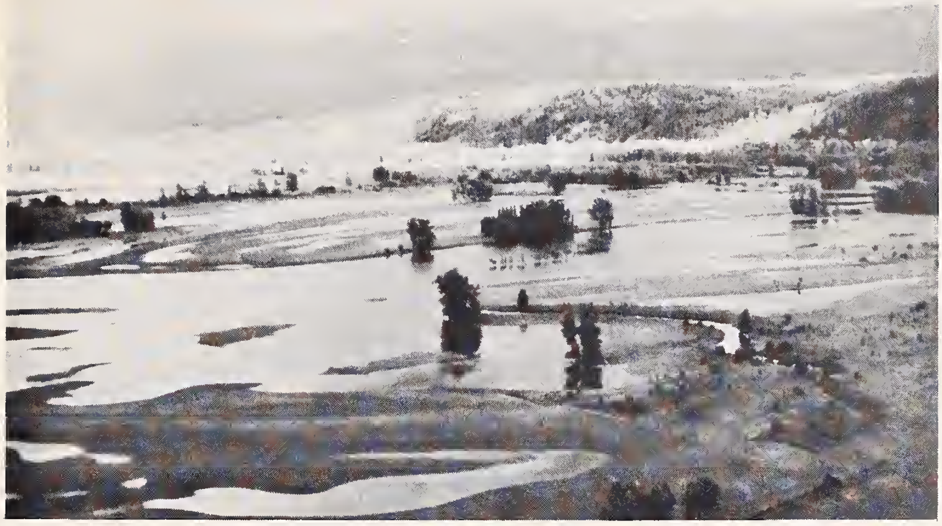


Figure 9. Agricultural lands in Kootenai Flats, Idaho, are flooded periodically. Areas, such as Drainage District #12 (pictured), are utilized by waterfowl and have considerable potential for waterfowl development. Operation of Libby project will reduce flooding and eliminate wetland areas of value to this wildlife group. (Photo used by permission of M. E. Shelman, Bonners Ferry).

Figure 10. Lands in the Kootenai Valley should be acquired for waterfowl development to mitigate losses occasioned by the project and to provide enhancement. (Photo courtesy Bureau of Sport Fisheries and Wildlife).

Acquisition of such lands in the United States for enhancement purposes would fulfill an international obligation for protection of migratory waterfowl and strengthen the case for reservation of similar lands in Canada (frontispiece and figure 10).

Due to the present lack of resting and feeding areas, waterfowl use of the valley in the United States is comparatively light. Large numbers of ducks, geese, and swans annually bypass the valley during fall and spring migrations from the Duck Lake area in British Columbia to eastern Washington and California (figure 11). If suitable habitat were provided, waterfowl populations from the north would utilize the Kootenai Valley as they have in the past. A recent waterfowl inventory of the Duck Lake area disclosed that 7,000 swans, 15,000 Canada geese, and 200,000 ducks had used the area in a period of a few weeks. The Idaho Department of Fish and Game estimates that an average of 2,400 waterfowl hunter-days are expended annually in the Lower Kootenai Valley in Idaho during a 30-day season, and that each hunter bags an average of 2.2 birds per day. With restoration of waterfowl habitat, these figures would be substantially increased and would provide a more equitable distribution and kill for this segment of the Pacific Flyway.

Other benefits would be realized through restoration of waterfowl habitat. Such a program would help relieve crop depredation in eastern Washington and California where heavy losses occur annually to truck and other agricultural crops. It would provide an overall population increase for the Pacific Flyway, restore habitat for fur animals and shore birds, and may provide incidental fishery benefits for local sportsmen.

Private lands, totaling 7,250.94 acres (see map No. 4), have been tentatively determined as suitable for waterfowl management purposes. It is anticipated that these lands would be acquired as a direct project cost to mitigate losses of waterfowl habitat destroyed by the project and for enhancement of waterfowl habitat in the Pacific Flyway.

The average estimated value of these lands is $230 per acre. Total acquisition costs for the recommended 7,251 acres is $1,667,730.

Initial costs for development of water-control structures and associated facilities are $158,000.

Annual operation and maintenance costs for this enhancement feature will be borne by the administrating State or Federal wildlife agency.

Wildlife Summary. The acquisition of lands described herein for wildlife management purposes will help alleviate the additional burden imposed by the Libby project upon State and Federal conservation agencies. In the case of waterfowl, it will exceed mitigation and provide opportunities for enhancement of the resource itself. It also will fulfill an international obligation and strenthen the case for reservation of similar lands in Canada.

Tables 3 and 4 following, summarize estimated costs of lands, facilities, and studies recommended for mitigation and enhancement of wildlife resources associated with Libby project.

Table 3. Estimated Costs of Wildlife Lands Associated with Libby Project

| Area | Purpose | Acreage | Average Cost per Acre | Total Cost |
|---|---|---|---|---|
| Lower Kootenai (Idaho) | Waterfowl | 7,251 | $230 1/ | $1,667,730 |
| Rexford Ranger District (W. of Kootenai River) | Big Game | 1,464 | 50 | 73,200 |
| East of Kootenai River (near Sophie Lake) | Big Game<br>Waterfowl<br>Upland Game | 3,431 | 65 | 223,015 |
| Kootenai Falls | Mountain Sheep | 288 | 270 | 77,760 |
| Warland Ranger District (Warex parcel) | Big Game | 60 | 50 | 3,000 |
| Total (rounded) | | | | $2,045,000 |

1/ Based on 1960 Boundary County assessment value.

Table 4. Estimated Gross Costs of Structures, Operation and Maintenance and Continuing Studies for Wildlife Associated with Libby Project

| Area | Item | Initial Cost | Annual O & M Costs |
|---|---|---|---|
| Lower Kootenai (Idaho) | Water control structures and associated facilities | $158,000 | $ 1/ |
| Rexford Ranger District (W. of Kootenai River) | One cattle guard and 4 miles of cattle drift fence | 6,300 | 1,260 |
| East of Kootenai River (near Sophie Lake) | 9-3/4 miles of cattle fence | 11,700 | 2,340 |
| Kootenai Falls | None | None | None |
| Warland Ranger District | Browse management for 455 acres | 22,750 | 4,500 2/ |
| Totals (rounded) | | $198,700 | $8,100 |

1/ Annual O & M costs for this enhancement feature will be borne by the administrating State or Federal wildlife agency.

2/ This figure is for continuing studies over a 10-year period.

Construction roads associated with Libby project should be made available for access by the public.

## Recommendations (United States)

It is recommended:

1. That approximately 1,500 acres of private lands in the Rexford Ranger District, west of Kootenai River, Montana, be acquired by Libby project and funds be provided for drift fencing and operation and maintenance to mitigate big-game losses.

2. That approximately 5,533 acres of private and State lands, east of Kootenai River, Montana, be acquired by Libby project, and funds be provided for perimeter fencing and operation and maintenance to mitigate wildlife losses.

3. That approximately 290 acres of private lands, located north of Kootenai River in Kootenai Falls area, Montana, be acquired by Libby project to mitigate losses to mountain sheep.

4. That approximately 60 acres of private lands, located in Warland Ranger District, Kootenai National Forest, east of Kootenai River, Montana, be acquired by Libby project as part of proposed management area to mitigate big-game losses.

5. That Libby project provide funds for development and management of approximately 450 acres of Kootenai National Forest lands, Warland Ranger District, Montana, to mitigate big-game losses, and that additional project funds be provided for continuing studies to investigate methods of increasing browse production on such lands.

6. That Great Northern Railway relocation route follow the Corps of Engineers' alternate route 4 instead of route 1. In the event that route 1 is selected, the relocation should be situated as much as feasible on the west side of Fisher River drainage throughout the section traversed,

and on the south side of Wolf Creek drainage to a point approximately 8 miles upstream from its mouth; and that facilities, including drift fences and game underpasses, be provided as deemed necessary by Montana Department of Fish and Game and Bureau of Sport Fisheries and Wildlife following project completion.

7. That approximately 7,300 acres of private lands in lower Kootenai Valley, Boundary County, Idaho, be acquired by Libby project for mitigation and enhancement of waterfowl resources affected by the project and funds provided for initial development costs.

8. That project construction roads be made available for public access.

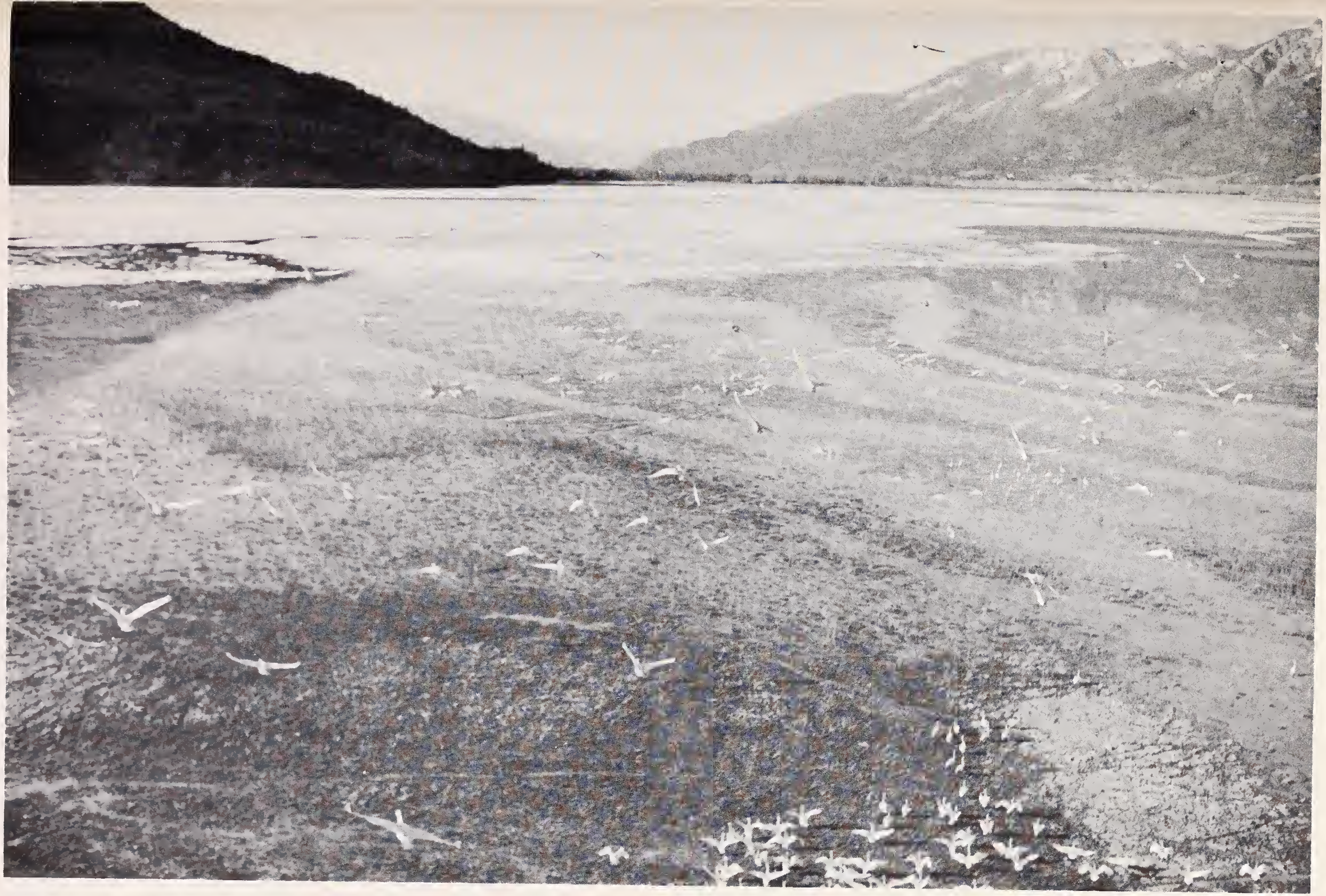


Figure 11. The Duck Lake area is one of the largest inland stopover points for waterfowl in the Pacific Flyway. Swans are among the many species of waterfowl utilizing this area. (Photo courtesy British Columbia Government).

# WILDLIFE (CANADA)

## The Resource and Problems

The Canadian section of the Libby project will be located within one of the most important big-game ranges on the North American continent. The extent and diversification of habitat supports a variety and density of big-game species elsewhere considered unique. Sparse settlement, the austerity of the region's agriculture, and patterns of social and economic development give wildlife resources a relatively high status in the district. Information available at this time indicates that wildlife values in, and adjacent to, the Libby project area in British Columbia are, at least, equivalent to those of other renewable resources. The unique status of wildlife resources in the Libby project area of influence in British Columbia warrants comprehensive investigation, planning, and action in mitigating the diverse effects of the project on this resource.

Habitat and populations of elk, mule deer, and white-tailed deer will be adversely affected by the project. Other wildlife groups adversely influenced include waterfowl, fur bearers, and upland-game birds.

Destruction of critical winter range of elk, white-tailed and mule deer comprises the greatest loss of the big-game resource. Summer range for some elk and a substantial white-tailed deer population will be lost. Loss of critical winter range will be seriously aggravated in the event of relocation of competitive forms of agriculture onto adjacent and neighboring areas of winter range.

Improvident location and construction of roads, highways, etc., may further damage big-game habitat in significant measure by reducing the continuity and carrying capacity of the habitat and its tenability to big-game animals. Local movements and seasonable migrations of big game may be impeded, resulting in adverse distribution and range use, as well as actual losses of big-game animals.

The liability of wetland reclamation in the Creston area resulting from flood and storage regulation involves a waterfowl resource of major national and international importance. Waterfowl populations associated with the river and marshy backwaters in the proposed reservoir area will be displaced completely. Geese, swans, and pond and diving ducks frequent the system in the proposed site during spring and fall migration, while both pond and diving ducks may be found on the river during winter months in most years. A small population of geese probably nest in portions of the reservoir area, while groups of nonbreeding birds are frequently observed during summer months. Shore birds, coot, and grebes are also found as migrants and residents.

Fur bearers, principally beaver, muskrat, mink, and otter, will suffer a serious loss of habitat in the reservoir area without any feasible means of mitigation. Squirrel and marten populations in wooded islands will be displaced also; however, these are of small significance.

A substantial population of native grouse will be displaced by the Libby project, principally willow and sharp-tailed grouse associated with island and river-edge habitat. Small numbers of Franklin's and blue grouse will be influenced.

The influence of the Libby project on access, and on land use and tenure, may have a major impact on the status and management of the wildlife resources. Policies and programs of land use and development in the project area should incorporate the requirements of wildlife and public use of this resource.

## Discussion

The quality, extent, and distribution of winter range determine the density and species composition of big-game populations in the East Kootenay region. Productive deer and elk winter range comprises a small portion of the region's lands and consists mainly of areas with suitable exposure below 4,000 feet elevation in the Rocky Mountain Trench. The extensive mountain and alpine areas of the district complement winter ranges by providing high-quality summer forage. Winter range use by big game normally extends from December 1 to April 30, while shorter and longer periods of use occur, depending on severity of winter weather.

Past burns on benchlands in the major valleys comprise the bulk of East Kootenay winter ranges, while areas of natural prairie and open timber stands contribute significantly. The potential carrying capacity of district winter ranges is high; however, large segments have been seriously depreciated through overgrazing and natural succession of forest cover. The combined influences of low precipitation, summer drought, alkaline soils, and a short growing season impede forest succession and thus enhance the capacity of the region's land to produce big game. Areas of outstanding game density adjacent to the Libby Reservoir in British Columbia include Sheep Mountain, Plumbob, Colvalli, and Pickering Hills. Remaining lands

in, and adjacent to, the reservoir site are supporting capacity populations of big game. Game numbers within, and adjacent to, the Libby Reservoir in British Columbia are not accurately known; however, the interpretation of annual harvest data provides a legitimate basis for estimates. Preliminary estimates based on harvest statistics indicate that a big-game population of 35,000 or more animals may be involved.

The inadequacy of current information does not permit an accurate appraisal of wildlife losses which will result from the Libby project. Direct losses to the big-game resource involve about 18,000 acres of winter and summer habitat below the 2,459 contour, about 9,000 acres of which are private lands. Remaining lands in the reservoir area are under Crown tenure, portions of which are in forest reserves. Indirect losses to the big-game resource would principally involve the relocation of competitive agriculture onto adjacent and neighboring winter ranges. Agriculture, principally marginal ranching, is the major competitor with the big-game resource in the Libby basin in Canada. The demand for land, grazing, and the effects of scattered settlement and disturbance on big-game habitat and populations are the major areas of conflict, while public use of the resource is also influenced. Relocation of displaced ranches onto adjacent benches will intensify competition with big game and further depress the economic status of both resources. In view of the extent and nature of conflict between the agricultural and wildlife resources in the basin area, as related to the regional economy and its projected future, it may be in the public interest to prevent or minimize relocation of displaced ranch operations. Certainly, relocations onto marginal and nonarable lands should not occur.

Project construction operations, road locations, etc., resulting in erosion and other mechanical damage to critical areas of habitat, or predisposing disturbance or losses to population of animals, may comprise a substantial form of indirect loss. For example, road locations, surface-stripping operations in search of gravel, pit locations, etc., on critical wintering slopes, preferred areas of range, and on or near game licks may prove damaging beyond an apparent degree. Proper consideration of these aspects of damage to big game is required.

Mitigation of game range lost through the Libby project could be accomplished in several ways. Reservation of suitable public and forest lands for the primary benefit of big game should be considered. Acquisition of suitable private lands adjacent to the reservoir should be considered as a means of mitigating big-game losses apart from, or in conjunction with, purchase of these lands in compensation for the owner's displacement. Multiple-use policies and practices on forest lands should be formulated as a means of mitigating losses to the game resource. Habitat improvement measures should be considered as a form of mitigation and could include clear cutting, controlled burning, modified logging practices, integrated range management, planting and seeding, and fence construction to control livestock competition. Short rotation forest crops, such as Christmas trees on winter range areas, should be investigated as a means of mitigation for big-game losses.

Comprehensive waterfowl habitat and population studies in relation to detailed engineering data and accurate knowledge of the periods and magnitudes of flood and storage levels in the Duck Lake vicinity are

required to interpret the impact of the Libby project on the waterfowl resource. Adverse flood and storage regulation in the vicinity of Duck Lake could seriously affect a major waterfowl resource. Waterfowl habitat development offers the most feasible opportunity for enhancement of a wildlife resource associated with the project. Mitigation to fur bearers displaced in the reservoir area could be realized in association with waterfowl habitat development.

Approximately 13,000 acres of Crown lands are potentially available to development as waterfowl habitat in the Duck Lake area. In addition, a large area of Indian Reserve lands between Duck Lake and the international boundary may be incorporated, through suitable agreement, into a fur and waterfowl production and management program. A large portion of Indian lands in the Creston area remains in a natural state and is used extensively by migrating waterfowl. Inclusion of these areas into the management plan for a waterfowl refuge at Duck Lake and vicinity would be an added benefit and would contribute substantially to the international benefits of the resource.

During the past 14 years, the British Columbia Fish and Game Branch, the Canadian Wildlife Service, and sportsmen's organizations have been striving to maintain the Duck Lake area for the protection of waterfowl (frontispiece and figure 11). The history of the controversy between conservation and agricultural interests is adequately covered in a report of the West Kootenay Association of Rod and Gun Clubs dated May 1960. The basis of their report was made from a study known as the Munro Plan, which was formulated by J. A. Munro, who made a comprehensive study of

the area for the British Columbia Game Commission in 1947 and 1956. Recent negotiations between the West Kootenay Association of Rod and Gun Clubs and the Duck Lake Dyking District have resulted in a mutual agreement, requesting the establishment of Duck Lake and remaining unreclaimed land in the vicinity as a refuge and management area.

The waterfowl management proposal of the Duck Lake area in conjunction with a similar management plan in north Idaho is unlimited. The elimination of the area would deprive waterfowl of the biggest Canadian inland stopover area in the Pacific Flyway, and the results would be disastrous to this segment of the Flyway. Preservation of both Idaho and Canadian habitat is essential to the continental program of waterfowl restoration and would undoubtedly enhance a more equitable distribution of the kill. The critical need for establishment and preservation of these areas is further emphasized by the fact that no waterfowl management areas exist within the central portion of the Province of British Columbia.

Mitigation for resting and migrating waterfowl populations displaced by the reservoir could involve subimpoundments, where feasible, and improvement of wetlands within the area of influence. Fencing of marsh and lakeshores against livestock would improve waterfowl production on adjacent areas of habitat, while provision of adequate access to these areas would serve to replace lost hunting opportunities in the reservoir site.

Destruction of shore and emergent vegetation, and the improbability of reestablishment on the reservoir edge, will eliminate food resources for

beaver and muskrat, while fluctuating water levels and winter drawdowns will eliminate the animals. Otter and mink populations will seriously decline along with the biological community now existing. Little can be done in the reservoir area to mitigate these losses. Subimpoundments on suitable sites could provide beaver and muskrat habitat; however, the feasibility of this measure is not presently known. Some compensation to fur-bearer losses in the reservoir area may be realized through development of waterfowl habitat in the vicinity of Duck Lake.

Inundation of riparian deciduous cover will destroy resident populations of ruffed grouse and eliminate an appreciable winter food resource of sharp-tailed grouse. Losses of Franklin's and blue grouse populations and habitat will be small. Mitigation for native grouse will be most practically realized in conjunction with proper development and management of big-game ranges. Improved range use practices will augment habitat and population of the relatively rare sharp-tailed grouse.

## Recommendations (Canada)

It is recommended:

1. That adequate funds be provided to appropriate agencies to make continued studies into the effects of the Libby project on wildlife resources.

2. That reservation and management of public lands and acquisition of forest reserve and private lands adjacent to the reservoir be made in mitigation for game habitat destroyed by the project on the basis of studies conducted by the appropriate agencies. It is further recommended that adequate funds be provided for the acquisition, development, and maintenance of these areas.

3. That land use programs, relocations, and developments on lands adjacent to the reservoir area should fully recognize and allow for requirements of the game resource and its management, including public access.

4. That consideration be given to the desirability of establishing, developing, and maintaining a waterfowl refuge area on lands suitable for this purpose within the Lower Kootenai Valley in Idaho, extending into British Columbia to the south end of Kootenay Lake, in mitigation for waterfowl habitat destroyed by the project and for enhancement of the waterfowl resource of the Pacific Flyway.

5. That grazing leases and permit lands in the Duck and Leach Lakes areas be reverted to a vacant Crown status and included in a waterfowl management program, along with existing Crown lands and necessary private lands.

6. That appropriate agencies negotiate the possibilities of including Indian Reserve lands on the Kootenay Flats at Creston in the proposed waterfowl management program.

7. That suitable waterfowl habitat and hunting areas adjacent to the Libby Reservoir be developed and managed to mitigate waterfowl losses in the East Kootenay district as determined by appropriate Canadian agencies.

8. That fur resource be considered in conjunction with waterfowl developments in mitigation of the fur resource lost in the impoundment area and as a possible reason for including Indian lands in the proposed waterfowl development at Creston.

9. That consideration be given to developing a satisfactory plan of reservoir clearing and estimate of cost.

# SUMMARY

Libby project is expected to result in considerable damage to fish and wildlife resources in the Kootenai River (Kootenay in Canada) drainage. If recommendations considered in this report are carried out, much of the loss would be compensated for. Possible enhancement to waterfowl could result provided recommendations for acquisition and development of lands along the lower Kootenai River, in Idaho, and in the Duck Lake area in Canada, are carried to a successful conclusion.

If recommendations are undertaken on only one side of the international boundary, their effectiveness will be somewhat curtailed. For instance, if reservoir clearing were conducted only in the United States' portion, floating debris would hamper boating and other recreational uses of the reservoir. Studies, fish stocking, nongame fish control, and developments for waterfowl would all be relatively less effective without satisfactory consideration and coordination on both sides of the border.

A substitute method for financing the cost of some fish and wildlife recommendations and other unforeseen postimpoundment effects has been proposed by the State of Montana. In the United States, this method would involve setting aside a specified amount of Libby project power revenues for use as needed in postimpoundment studies, construction, operation, and maintenance of fish and wildlife and measures associated with Libby project. In Canada, a portion of the revenue derived from the power allocated to Canada as a result of Libby project could be earmarked for the same purposes. The planning committee includes this

proposal for further consideration, recognizing that congressional legislation is required.

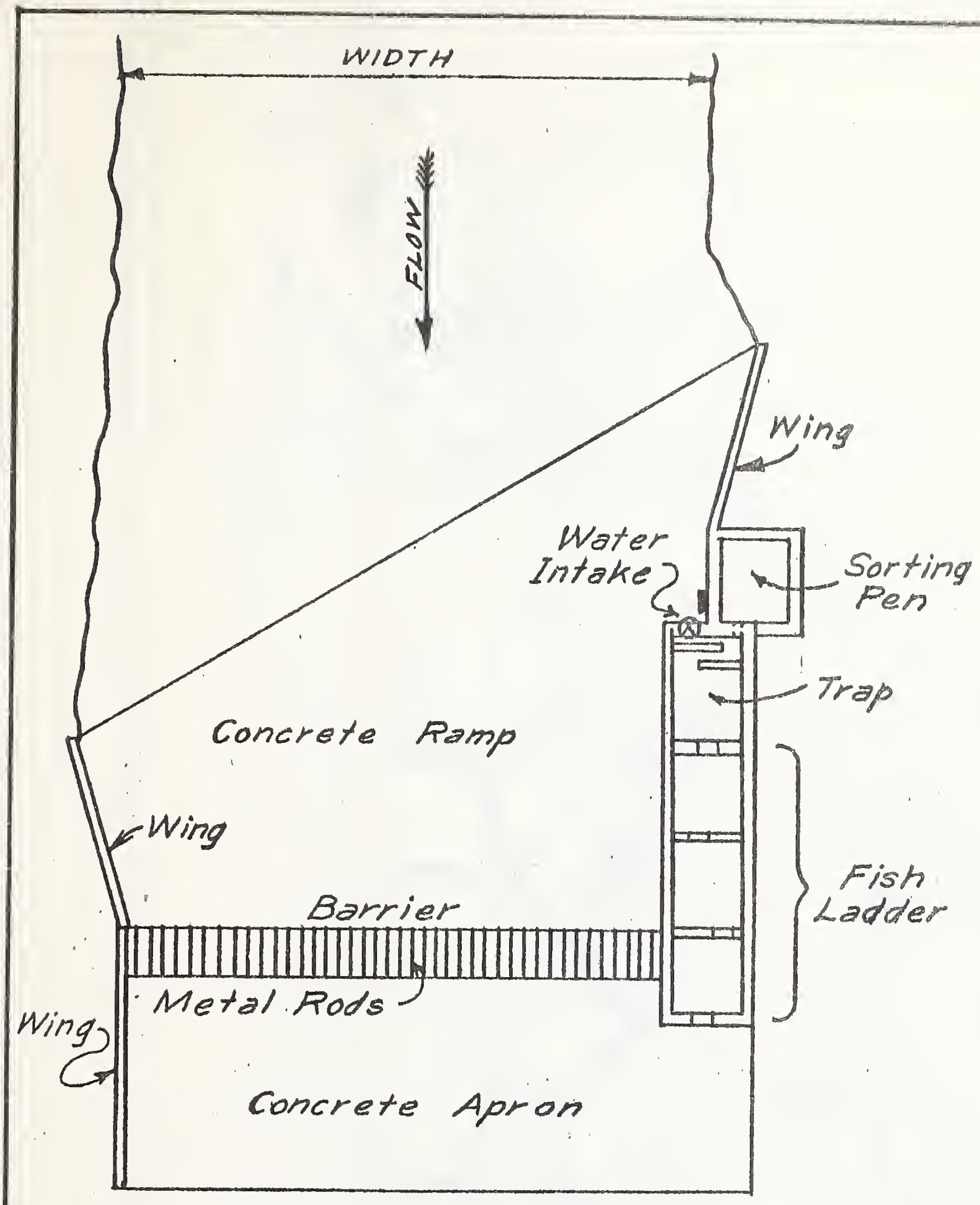
Stock recommendations not previously discussed in this report are as follows:

a. "That Federal lands and project waters in the project area be open to public use for hunting and fishing except for such portions as may be reserved by State, Provincial, or Federal fish and game agencies in the interest of conservation and development or by the Corps of Engineers for purposes of safety, efficient operation, and protection of public property.

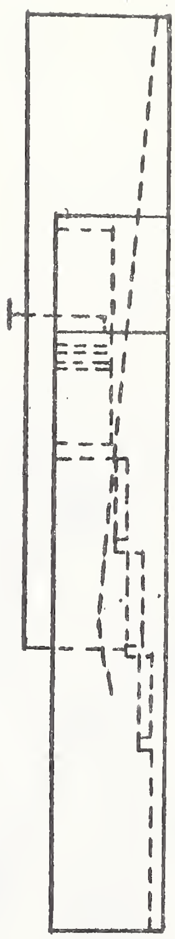
b. "That such reasonable modifications be made in the authorized project facilities and their operation as may be agreed upon by Montana and Idaho Departments of Fish and Game, British Columbia Fish and Game Branch, Canadian Wildlife Service, U.S. Forest Service, Bureau of Sport Fisheries and Wildlife, and Corps of Engineers for conservation, improvement, and development of fish and wildlife resources.

c. "That appropriate consideration be given to development of a reservoir zoning plan in connection with overall planning for Libby Reservoir to insure that certain areas or certain periods of time would be available for fishing, hunting, and other fish and wildlife purposes without conflicting uses for general recreation. Such a plan would be developed cooperatively by interested fish and wildlife conservation agencies and the Corps of Engineers for recommendation to the appropriate regulatory agencies."

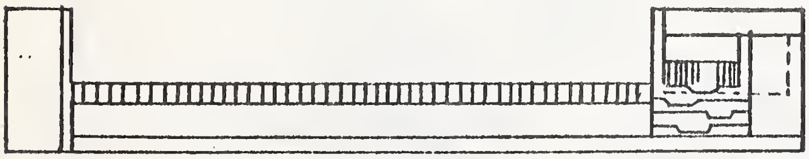
# APPENDED MATERIAL



PLAN VIEW



SIDE ELEVATION

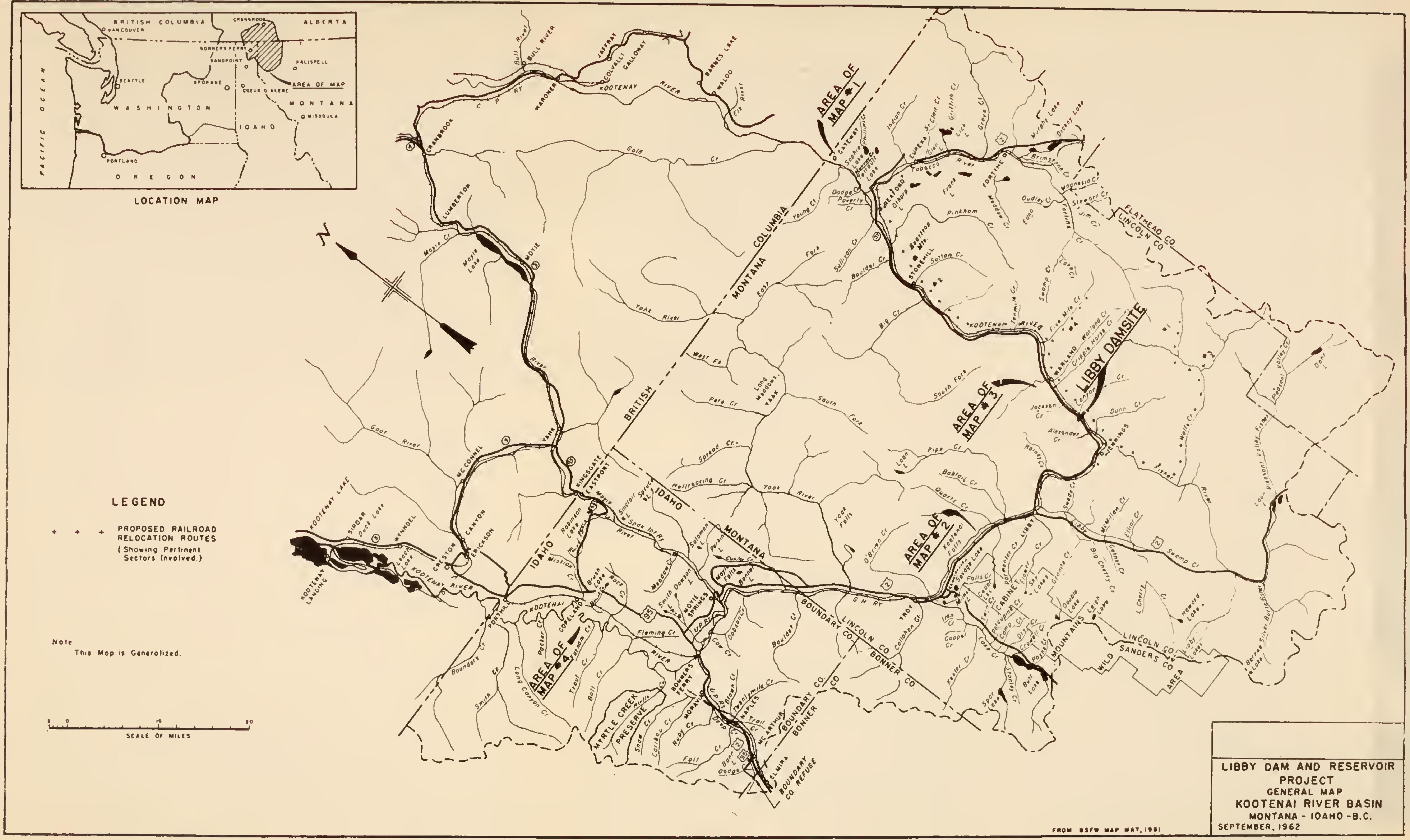


FRONT ELEVATION

LIBBY DAM AND RESERVOIR PROJECT

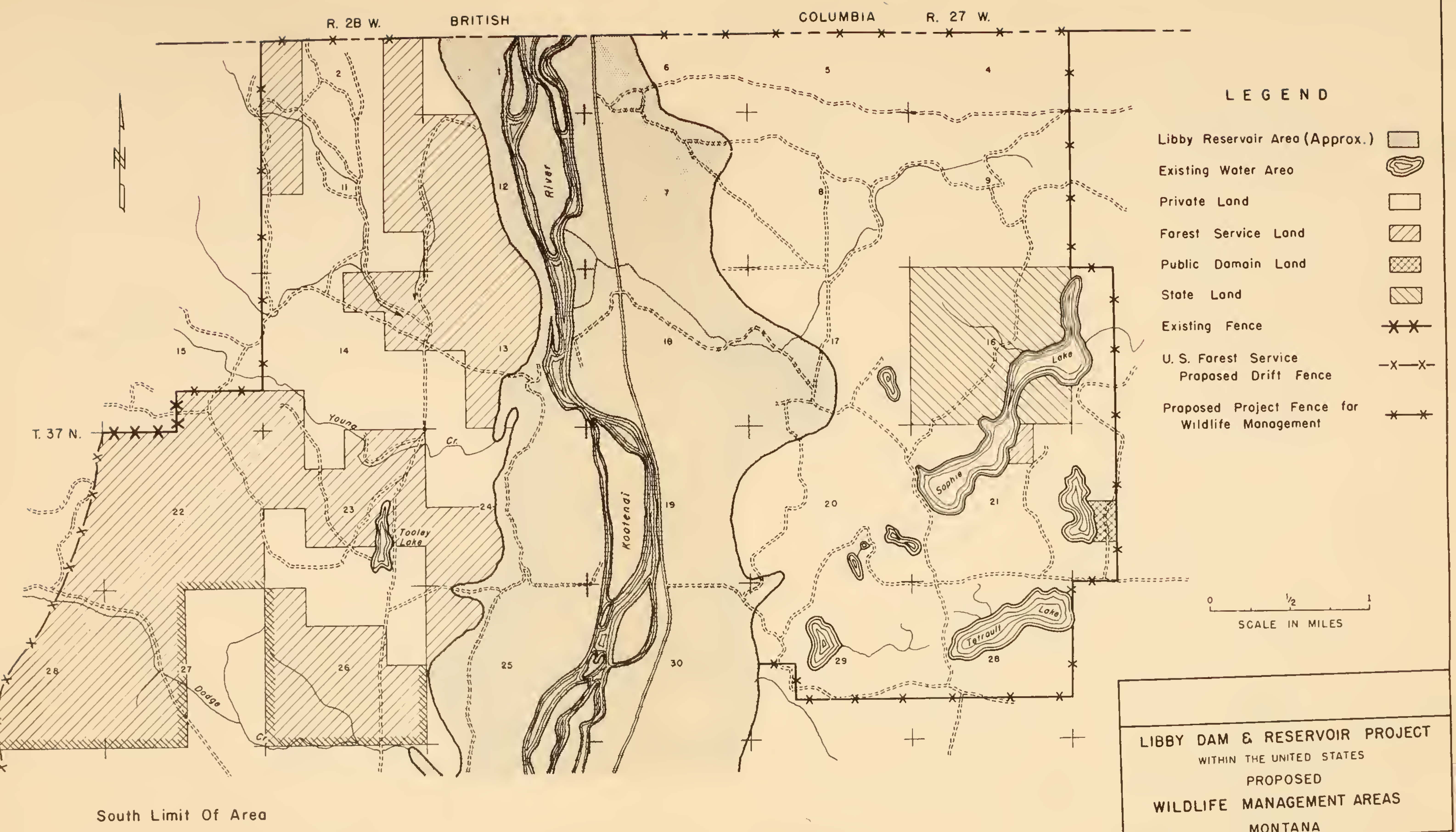
GENERAL PLAN
PROPOSED UPSTREAM FISH BARRIER

OCTOBER 1962 APPENDIX I



LIBBY DAM AND RESERVOIR PROJECT
GENERAL MAP
KOOTENAI RIVER BASIN
MONTANA - IDAHO - B.C.
SEPTEMBER, 1962

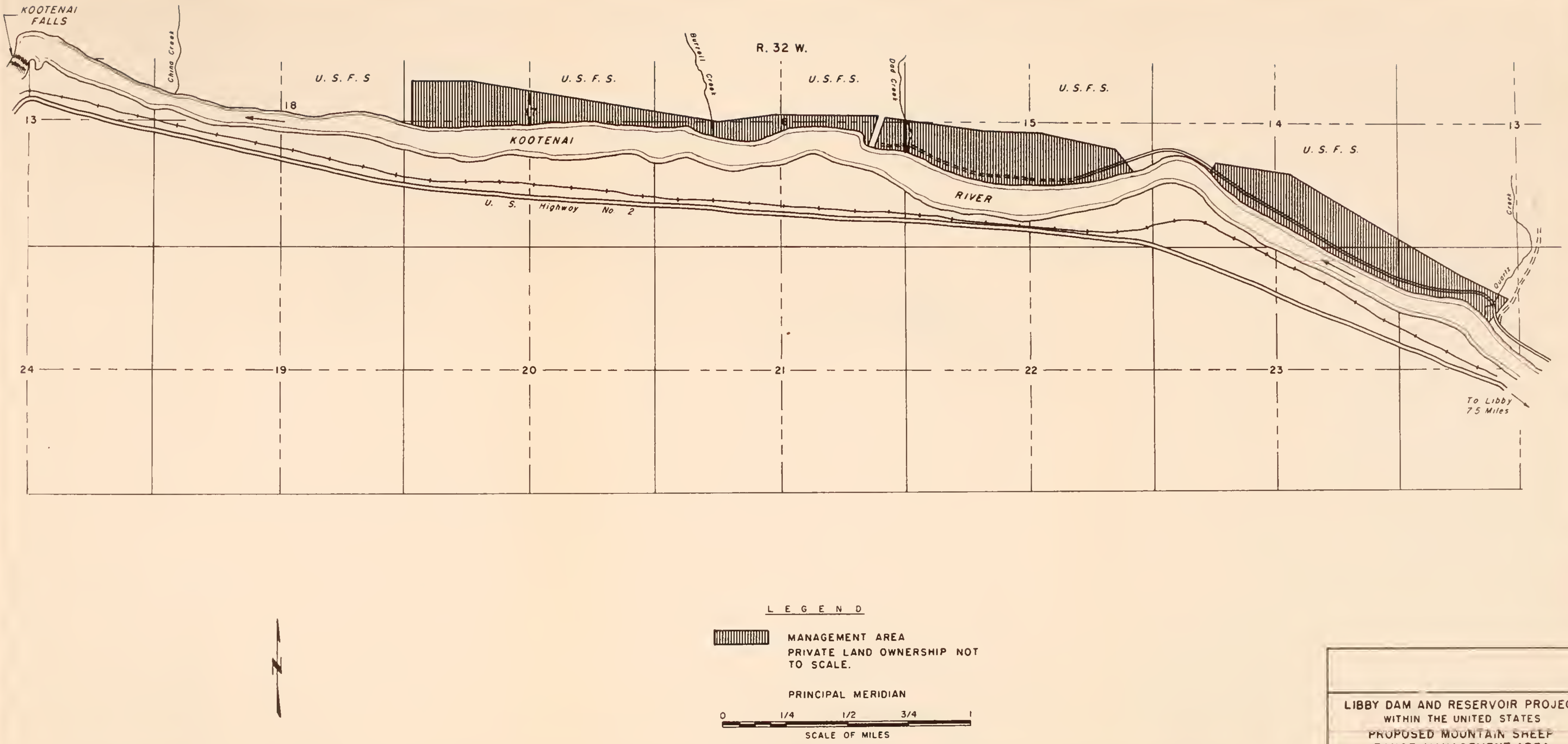
FROM BSFW MAP MAY, 1961



LIBBY DAM & RESERVOIR PROJECT
WITHIN THE UNITED STATES
PROPOSED
WILDLIFE MANAGEMENT AREAS
MONTANA

SEPTEMBER, 1962

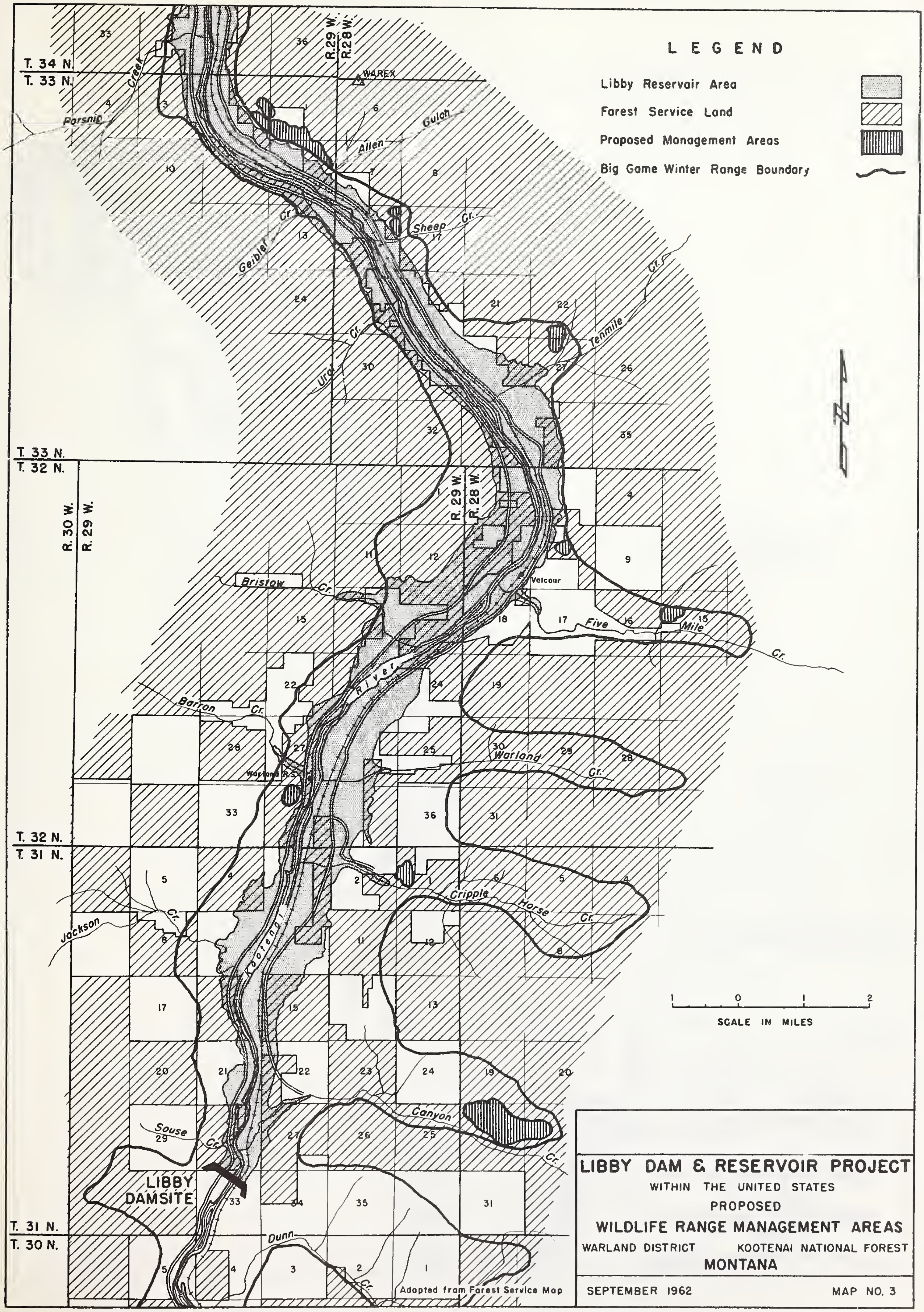
MAP No. 1



LIBBY DAM AND RESERVOIR PROJECT
WITHIN THE UNITED STATES
PROPOSED MOUNTAIN SHEEP
RANGE MANAGEMENT AREA
MONTANA

SEPTEMBER, 1962 MAP No. 2

From M.F.G. Map. July 1959



LIBBY DAM & RESERVOIR PROJECT

WITHIN THE UNITED STATES

PROPOSED

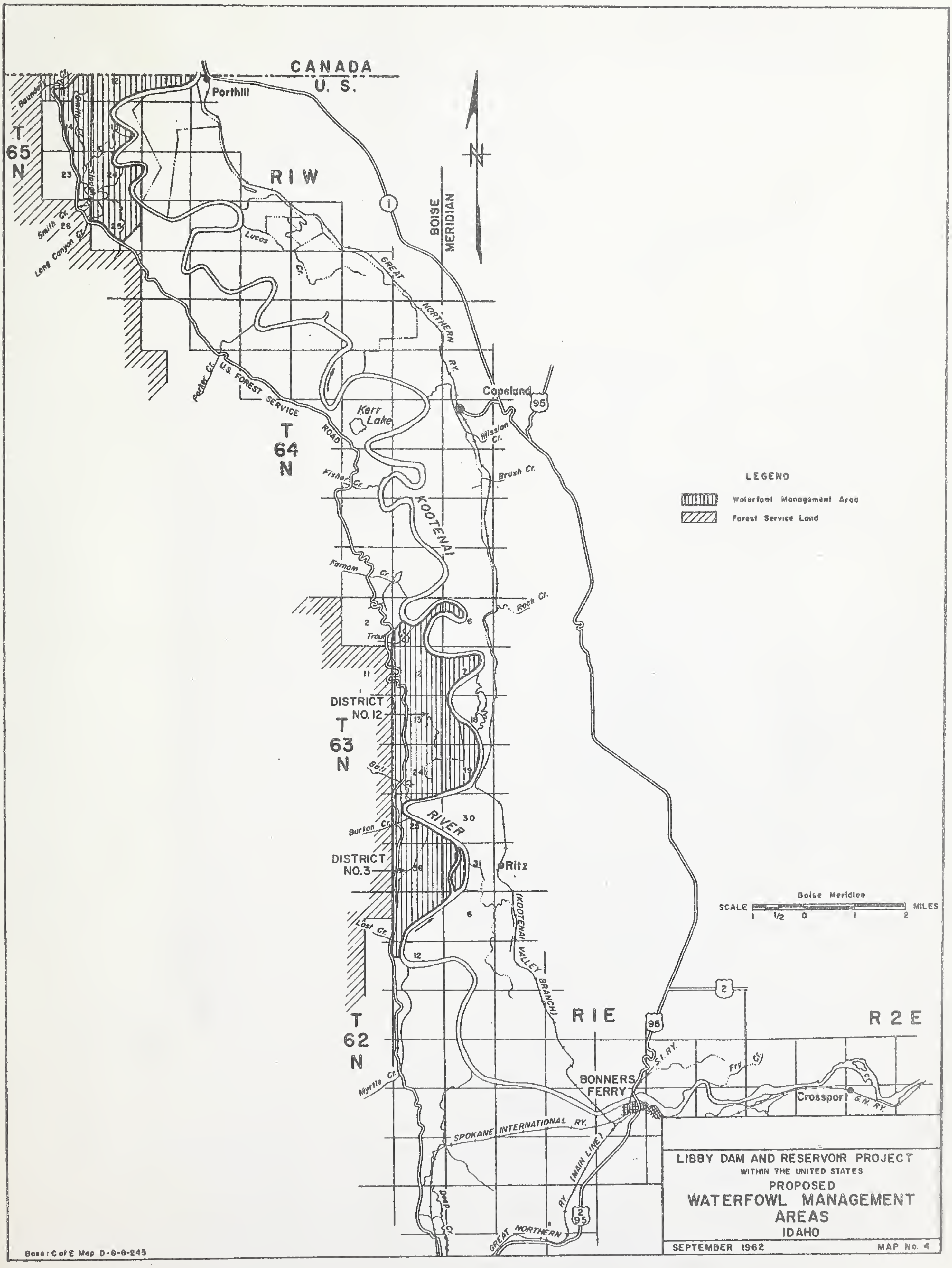
WILDLIFE RANGE MANAGEMENT AREAS

WARLAND DISTRICT KOOTENAI NATIONAL FOREST

MONTANA

SEPTEMBER 1962 MAP NO. 3

Adapted from Forest Service Map



LIBBY DAM AND RESERVOIR PROJECT
WITHIN THE UNITED STATES
PROPOSED
WATERFOWL MANAGEMENT
AREAS
IDAHO

SEPTEMBER 1962

MAP No. 4